HEATH'S
LOGARITHMIC
AND
TRIGONOMETRIC TABLES

WITH AN INTRODUCTION BASED
ON CURTISS AND MOULTON'S TRIGONOMETRY

BY

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INTRODUCTION

1. Definition of the logarithm of a number. *If a number* N *is expressed as a power of* **10,**

$$N = 10^x,$$

then the exponent, x*, is called the logarithm of* N (to the base 10); in symbols we write,

$$\log N = x.$$

Thus by definition

$$10^{\log N} = N.$$

More generally, if

$$a^x = N,$$

then x *is the logarithm of* N *to the base* a, and we write

$$\log_a N = x.$$

Thus by definition

$$a^{\log_a N} = N.$$

For computational purposes the base 10 is most convenient. For theoretical purposes in higher mathematics a base called e, where

$$e = 2.71828 \cdots,$$

is simplest to use. Logarithms to the base 10 are called *common* logarithms; to the base e *natural* logarithms. Except when otherwise indicated the base is understood to be 10.

No power of 10 yields a negative number; hence negative numbers do not have logarithms.

2. Exponents. From the definition of logarithm given above it is seen that *logarithms* are *exponents*. We therefore shall find it profitable to review briefly the general laws of exponents.

We shall assume that the *base* a is positive; the *exponents* m and n are any real numbers.

(1) $$a^m \cdot a^n = a^{m+n}.$$

(2) $$\frac{a^m}{a^n} = a^{m-n} = \frac{1}{a^{n-m}}.$$

(3) $$(a^m)^n = a^{mn}.$$

(4) $$a^{\frac{1}{r}} = \sqrt[r]{a},\ (r \text{ is a positive integer}).$$

(5) $$a^{\frac{p}{r}} = \sqrt[r]{a^p} = (\sqrt[r]{a})^p.$$

(6) $$a^{-n} = \frac{1}{a^n}.$$

(7) $$a^0 = 1.$$

3. Fundamental laws of logarithms.

I. *The logarithm of the product of two numbers equals the sum of the logarithms of the factors.* That is,

(1) $$\log MN = \log M + \log N.$$

II. *The logarithm of the quotient of two numbers equals the logarithm of the dividend minus the logarithm of the divisor.* Symbolically,

(2) $$\log \frac{M}{N} = \log M - \log N.$$

III. *The logarithm of the* **n***th power of a number equals* **n** *times the logarithm of the number.* That is,

(3) $$\log M^n = n \log M.$$

IV. *The logarithm of the* **r***th root of a number is one* **r***th of the logarithm of the number.* In symbols,

(4) $$\log \sqrt[r]{M} = \frac{1}{r} \log M.$$

The proofs of these theorems are as follows:

By definition

$$M = 10^{\log M},\quad N = 10^{\log N}.$$

$$MN = 10^{\log MN},\text{ and } \frac{M}{N} = 10^{\log \frac{M}{N}}.$$

By the first law of exponents,

$$MN = 10^{\log M} \cdot 10^{\log N} = 10^{\log M + \log N}.$$

Therefore

$$\log MN = \log M + \log N,$$

which is Law I.

Similarly, by the second law of exponents,

$$\frac{M}{N} = \frac{10^{\log M}}{10^{\log N}} = 10^{\log M - \log N}.$$

Therefore

$$\log \frac{M}{N} = \log M - \log N,$$

which is Law II.

By the third law of exponents,

$$M^n = (10^{\log M})^n = 10^{n \log M}.$$

Hence

$$\log M^n = n \log M,$$

which is Law III.

The fourth law follows from the third since

$$\sqrt[r]{M} = M^{\frac{1}{r}}.$$

For we have

$$\log \sqrt[r]{M} = \log M^{\frac{1}{r}} = \frac{1}{r} \log M.$$

NOTE. The preceding laws are true whatever base of logarithms is used. To prove them for a base a, we simply replace 10 by a throughout the argument.

4. Characteristic and mantissa. As examples of logarithms, we may write the following pairs of equivalent statements:

$10 = 10^1,$	$\log 10 = 1;$
$100 = 10^2,$	$\log 100 = 2;$
$1000 = 10^3,$	$\log 1000 = 3;$
$1 = 10^0,$	$\log 1 = 0;$
$.1 = 10^{-1},$	$\log .1 = -1;$
$.01 = 10^{-2},$	$\log .01 = -2.$

The logarithms of the numbers 10, 100, 1000, ⋯ are the positive integers 1, 2, 3, ⋯; the logarithm of 1 is 0; and the logarithms of .1, .01, .001, ⋯ are the negative integers -1, -2, -3, ⋯. The logarithm of any other positive number can be expressed as the sum of an integral part and a positive decimal part. The integral part is called the *characteristic*, the decimal part the *mantissa* of the logarithm of the number.

For example, in Table VII (p. 73) we find

$$\log 25 = 1.39794.$$

The characteristic is 1 and the mantissa .39794.

Again

$$\log 5 = 0.69897.$$

The characteristic is 0 and the mantissa .69897.

The logarithm of any number between 1 and 10 lies between log 1 and log 10, that is, between 0 and 1. Hence, *the characteristic of the logarithm of any number between* 1 *and* 10 *is* 0.

To get a general rule for the characteristic let us consider the following examples:

$$\begin{aligned} 50 &= 10 \cdot 5, & \log 50 &= \log 10 + \log 5 &&= 1.69897; \\ 500 &= 100 \cdot 5, & \log 500 &= \log 100 + \log 5 &&= 2.69897; \\ .5 &= .1 \cdot 5, & \log .5 &= \log .1 + \log 5 &&= -1 + 0.69897; \\ .05 &= .01 \cdot 5, & \log .05 &= \log .01 + \log 5 &&= -2 + 0.69897. \end{aligned}$$

By *units' place* in a number we mean the first place to the left of the decimal point when the number is written in decimal notation. Thus for each of the numbers 4.2, 34, and 604.71, the digit 4 is in units' place.

Suppose now that, for a given number N, in going from the first significant figure to units' place we move K places to the right; then the number can be expressed as $10^K N'$, where N' is a number between 1 and 10. Thus, $500 = 10^2 \cdot 5$. Hence

$$\log N = \log 10^K + \log N' = K + \log N';$$

and the characteristic of $\log N$ is K.

Suppose next that in going from the first significant figure of N to units' place we move K places to the left; then the number can be expressed as $10^{-K}N'$, where N' is between 1 and 10. Thus, $.05 = 10^{-2} \cdot 5$. Hence

$$\log N = \log 10^{-K} + \log N' = -K + \log N'$$

and the characteristic of $\log N$ is $-K$.

Rule. *To find the characteristic of log* **N**, *first find how far it is from the first significant figure of* **N** *to units' place. If it is*

***K** places to the right, the characteristic is **K**.*
***K** places to the left, the characteristic is $-$ **K**.*

Thus the characteristic of log 9.3 is 0; of log 93,000,000 is 7; of log .123 is -1; and of log .000005 is -6.

From the preceding paragraphs we see that the mantissa of $\log N$ is $\log N'$, where N' is the number between 1 and 10 which is obtained from N by merely shifting the decimal point to the proper place. Hence *the mantissa depends only on the succession of digits in* **N**, *and not at all on the position of the decimal point.* Accordingly the decimal point may be ignored when one looks for the mantissa. The mantissa is found from a table of logarithms as explained in the descriptions of Tables III and VII.

When the characteristic is negative, care must be taken in writing the logarithm. Thus it would be a mistake to write

$$\log .05 = -2.69897,$$

for the number in the right member equals $-2 - .69897$ and not the correct value $-2 + .69897$. One commonly used way of writing the logarithm is $\bar{2}.69897$, it being understood that only the characteristic is affected by the negative sign. Another method is to use such relations as

$$-2 = 8 - 10 = 18 - 20$$

and write

$$\log .05 = 8.69897 - 10 = 18.69897 - 20.$$

We shall adopt the latter system, in which the negative characteristic is expressed as a positive integer minus a multiple of 10.

NOTE. If another base of logarithms than 10 were used, we would not have such simple rules for finding characteristic and mantissa. It is because of this relative simplicity that the base 10 is generally used in computations.

TABLE I. SQUARES OF NUMBERS

5. Squares of numbers. This table gives the approximate values of the squares of numbers from 1.00 to 9.99. Its use is illustrated in the following examples.

Examples. — 1. To find $(5.92)^2$.

On page 3, go down the column headed N to 5.9, then across to the column headed 2. The approximate value required is found to be 35.05.

2. To find $(5.925)^2$.

We interpolate with the aid of the adjacent table (it should be done mentally after a little practice) and obtain the correction,

$$x = 5/10 \times 11 = 5.5 = 6$$

approximately. We then have the approximation,

	N	N^2		
10	5.920	35.05	x	11
	5.925	——		
	5.930	35.16		

$$(5.925)^2 = 35.05 + .06 = 35.11.$$

3. To find $(59.25)^2$.

We have

$$59.25 = 10 \times 5.925;$$
$$(59.25)^2 = 10^2 \times (5.925)^2 = 100 \times 35.11, \text{ from Example 2,}$$
$$= 3511.$$

Similarly,

$$(592.5)^2 = 100^2 \times (5.925)^2 = 351{,}100;$$
$$(.5925)^2 = .3511;$$
$$(.05925)^2 = .003511.$$

It should now be clear how the approximate value of the square of any number whatever is found. We may formulate the rule: *For a given number, shift the decimal point to the right (or left)* k *places to obtain a number between* 1 *and* 10. *Find the square of this from the Table. Shift the decimal point in this result* $2k$ *places to the left (or right) to get the required square.*

6. Square roots. The square root of a number n in the interior of Table I is given by the corresponding number N read off from the left of the row and the top of the column in which n lies. We may, therefore, use the Table of Squares for the extraction of square roots.

We note that the interior numbers lie between 1 and 100. We get the square roots of numbers in this range directly, though interpolation may be needed. Thus

$$\sqrt{3.496} = 1.870, \qquad \sqrt{34.96} = 5.912.$$

A number which does not lie between 1 and 100 can be expressed as the product of such a number by a power of 10 whose square root is simple. Thus

$$\begin{aligned} 349.6 &= 100 \times 3.496, & .3496 &= .01 \times 34.96, \\ 3496. &= 100 \times 34.96, & .03496 &= .01 \times 3.496, \\ 34960. &= 10000 \times 3.496, & .003496 &= .0001 \times 34.96. \end{aligned}$$

Hence

$$\begin{aligned} \sqrt{349.6} &= \sqrt{100} \times \sqrt{3.496}, & \sqrt{.3496} &= \sqrt{.01} \times \sqrt{34.96}, \\ &= 10 \times 1.870, & &= .1 \times 5.912, \\ &= 18.70, & &= .5912, \\ \sqrt{3496.} &= 59.12, & \sqrt{.03496} &= .1870, \\ \sqrt{34960.} &= 187.0. & \sqrt{.003496} &= .05912. \end{aligned}$$

It should now be clear how the approximate square root of any number whatever can be found by use of the Table. A rule may be formulated as follows: *For a given number shift the decimal point an even number of places, say* $2k$, *to the right (or left) to get a number between* 1 *and* 100. *Find the*

square root of this number from the Tables. In this square root shift the decimal point k *places to the left (or right) to get the required number.*

TABLE II. FOUR-PLACE VALUES OF FUNCTIONS AND RADIANS

7. Angles 10′ apart are given from 0° up to 45° in the first column of pages 4–8, and from 90° down to 45° in the last column. The values of the functions are given in successive columns. For angles given at the *left*, we read the name of the function at the *top* of the columns; for angles at the *right*, we read the functions at the *bottom* of the columns.

Examples. — 1. To find sin 4° 40′.

We look on page 4, go down the left-hand column headed "Degrees" to 4° 40′ and across to the column headed "Sin"; the entry is 814, which means that sin 4° 40′ = .0814, the first digit, in this case 0, being given only at intervals in this table.

2. To find cot 14° 10′.

We turn to page 5, go down the first column to 14° 10′, across to the column headed "Cot" and read 3.962. Thus cot 14° 10′ = 3.962.

3. To find cos 66° 20′.

We turn to page 6, go *up* the last column to 66° 20′, across to the column with "Cos" at the *bottom*, and read .4014. That is, cos 66° 20′ = .4014.

4. Given that tan A = .7954, to find A.

Look down the column headed "Tan" to entry .7954; go across to the first column and find A = 38° 30′.

8. Interpolation. In finding the value of a function of an angle, such as 17° 23′, which is not given in the Table but lies between two angles that appear, we use the method of *interpolation*, as illustrated in Examples 1 and 2 below. In Examples 3 and 4 the method is applied in finding the angle when the value of one of its functions is given.

Examples. — 1. To find sin 17° 23′.

The given angle, 17° 23′, is three-tenths of the way from 17° 20′ to 17° 30′. We assume that sin 17° 23′ is three-tenths of the way from sin 17° 20′ to sin 17° 30′. The sine of 17° 23′ will then be obtained by taking 3/10 of the amount by which sin 17° 30′ exceeds sin 17° 20′, and adding this *correction* to sin 17° 20′. Hence

$$\begin{aligned}\sin 17° 23' &= \sin 17° 20' + 3/10\ (\sin 17° 30' - \sin 17° 20')\\ &= .2979 + 3/10\ (.0028) = .2979 + .00084\\ &= .2987 \text{ approximately.}\end{aligned}$$

Since the Tables give values to only four places, we give only four places in our value of sin 17° 23′. This amounts to calling the correction .0008 instead of .00084. We would have used .0008 for any correction greater than .00075 and less than .00085. It is customary to disregard the decimal point in the tabulated values and call the *tabular difference* 28 instead of .0028, and the correction 8 instead of .0008.

Another way to explain the preceding interpolation is to state that we have assumed that when an angle increases, its sine increases proportionally; or, in other words, that differences between angles are proportional to differences between their sines. For the examples just solved the accompanying small table indicates these differences. We thus have

$$\frac{x}{28} = \frac{3}{10}.$$

Then $x = 8.4 = 8$ approximately; and

$$\begin{aligned}\sin 17° 23' &= .2979 + .0008\\ &= .2987.\end{aligned}$$

	Angle	Sin	
10	17° 20′	.2979	
3	17° 23′	——	x
	17° 30′	.3007	28

The assumption just made that differences between angles are proportional to differences between the values of a function of those angles is not exactly true, but it gives rise to errors which are negligible when the differences involved are small.

2. To find cot 17° 15′.

From the little table at the right we have

$$x = 5/10 \times 33 = 16.5.$$

	Angle	Cot	
10	17° 10′	3.237	
5	17° 15′	——	x
	17° 20′	3.204	33

The correction x could be called either 16 or 17. In all such cases we shall arbitrarily use the even numbers; here we take $x = 16$. We note that the cotangent *decreases* when we go from 17° 10′ to 17° 20′; hence the correction, which should take us 5/10 of the way from cot 17° 10′ to cot 17° 20′, must be subtracted from the former. We have

$$\cot 17° 15' = 3.237 - .016 = 3.221.$$

3. Given $\tan A = .4361$, to find A.

We find that the angle A lies between 23° 30′ and 23° 40′, as shown to the right. By the principle of proportional differences we have

$$x = \frac{13}{35} \times 10 = \frac{130}{35} = 3.7.$$

	Angle	Tan	
10	x	23° 30′	.4348	13
		A	.4361	
		23° 40′	.4383	35

Hence

$$A = 23° 30' + 4' = 23° 34'.$$

4. Given $\cos A = .4100$, to find A.

Proceeding as before we have

$$x = \frac{20}{26} \times 10 = 8.$$

	Angle	Cos	
10	x	65° 40′	.4120	20
		A	.4100	
		65° 50′	.4094	26

Hence

$$A = 65° 48'.$$

9. Conversion Table. In the second column of each page of Table II will be found the radian equivalent of the degrees and minutes in the first column. By the use of this Table, with interpolation, we can convert the measure of an angle from degrees and minutes into radians with four-place accuracy; and vice versa we can change four-place radian measure into degrees and minutes.

Example. — Express 20° 23′ in radians.

$$20° 20' = .3549 \text{ radians}$$
$$20° 30' = .3578 \text{ radians}$$

For 20° 23′ the correction which should be added to .3549 would be $\frac{3}{10} \times 29 = 9$, giving .3558 radians.

TABLE III. FOUR-PLACE LOGARITHMS OF NUMBERS

10. Finding logarithms from a table. In this table the mantissas are given correct to four decimal places for the integers from 100 to 999. The direct use of the table is illustrated in the following examples.

Examples. — 1. To find log 320 to four places.

From the rule we find that the characteristic is 2. For the mantissa turn to Table III. We go down the column headed N to the number 32, across the row to the column headed 0 and find 5051. When the decimal point, which is omitted in the Table for simplicity in printing, is placed ahead of the first 5, this is the mantissa. Hence

$$\log 320 = 2.5051 \text{ to four places.}$$

2. To find log 325 to four places.

In this case go across in the row 32 to the column headed 5 and find 119. The first figure of log 320 which occurs at the beginning of the row 32 in column 0 is understood to precede this, so that the mantissa is .5119; hence

$$\log 325 = 2.5119.$$

3. To find log .507 to four places.

To go from the first significant figure, 5, to units' place we move one place to the left; hence the characteristic is -1. In Table III in row 50 go across to column 7, and find *050; this is *not* to be preceded by the first figure, 6, in log 500; the * calls attention to a change, and we are to take the first figure, 7, of logarithms in the next row. Thus the mantissa is .7050, and we have

$$\log .507 = 9.7050 - 10.$$

4. To find log .06378 to four places.

We may form the little table to the right by reference to Table III. The required logarithm is .8 of the way from log 637 toward log 638. Hence we must add .8 of the difference 8048 − 8041 as a *correction* to 8041; the correction is therefore $.8 \times 7 = 5.6 = 6$ approximately. The same correction could be found in the mar-

N	$\log N$
637	8041
637.8	
638	8048

ginal table on the right in row 63 and column 8. We add the correction and put in the decimal point to get the mantissa. The characteristic being -2, we have the result

$$\log .06378 = 8.8047 - 10.$$

11. Finding a number whose logarithm is given. If the logarithm of a number is given and the number is required, the steps of the preceding section are reversed, as illustrated in the following examples.

Examples. — 1. Given $\log N = 1.9258$, to find N.

We look in the four-place logarithm table for the mantissa .9258. On page 11 we find the corresponding number 8430, the final zero indicating that no interpolation is necessary and that the number differs from 8430 by very little — less than 1. Since the characteristic is 1, units' place is one place to the right of the first significant figure. Hence

$$N = 84.30.$$

2. Given $\log N = 5.5011$, to find N.

The mantissa .5011 is found in row 31 and column 7; it corresponds to the number 3170. Since the characteristic is 5, units' place is 5 places to the right of the 3. Hence

$N = 317000$ to four significant figures.

3. Given $\log N = 8.8080 - 10$, to find N.

The mantissa .8080 lies between two tabulated values, 8075 and 8082, and hence we interpolate. The given mantissa is 5/7 of the way from the first to the second of these values in the Tables. The difference of the corresponding numbers 6420 and 6430 in the Tables is 10. Hence we add the correction $x = 5/7 \times 10 = 7$ to 6420 and get 6427. Since the characteristic is -2, units' place is two places to the left of the 6. Hence $N = .06427$.

		N	$\log N$		
10	x	6420	8075	5	7
			8080		
		6430	8082		

Instead of interpolating as we did, we could use the marginal table under Prop. Pts. on the right (p. 11). The difference 5 between

the value 8075 in the Table and the given value 8080 is found in the row 64 in both columns 7 and 8 of this marginal table. Under the agreement to make the correction even when we have a choice, we take 8 as the fourth digit, and this is to be placed after the number 642 which corresponds to the mantissa 8075, giving 6428. Hence $N = .06428$.

The values of N found by the methods of the two preceding paragraphs differ by a unit in the last place.

Table IV. Four-Place Logarithms of Functions

12. Logarithms of functions. Table IV, pages 12–17, gives four-place logarithms of the functions at intervals of 10′. For angles from 0° to 45°, which are found in the first column, we read the functions at the top of other columns; for angles from 45° to 90°, found in the last column, we read the functions at the bottom. The third column, which is headed **d 1′**, gives the change in the logarithm of the sine (**L Sin**) for a change of 1′ in the angle; this aids in interpolations. The fifth column, headed **cd 1′**, shows the common difference of the logarithms of the tangent and the cotangent for a change of 1′ in the angle. The next to last column gives the corresponding difference for the logarithm of the cosine.

The characteristic which is printed in the Table must be decreased by 10, the -10 having been omitted for simplicity of printing.

Examples. — 1. To find log sin 23° 52′ to four places.

On page 15 of the Tables we go down the first column to 23° 50′, across to the column headed L Sin, and read 9.6065. Since the difference for 1′ between angles 23° 50′ and 24° 00′ is 2.8, the *correction* for 2′ is $2 \times 2.8 = 6$ approximately. And since the L Sin increases when the angle increases we add the correction. Hence

$$\log \sin 23° 52′ = 9.6071 - 10.$$

2. To find log tan 52° 18′ to four places.

On page 17 of the Tables we find 52° 10′ in the last column; we go across to the column having L Tan at the bottom, and read 10.1098.

The difference for 1′ between 52° 10′ and 52° 20′ is 2.6. Hence the correction for 8′ is $8 \times 2.6 = 21$ approximately. Since L Tan increases when the angle increases from 52° 10′ to 52° 20′, we add the correction. The final result is

$$\log \tan 52° 18′ = 10.1119 - 10 = 0.1119.$$

3. To find log cos 71° 33′ to four places.

On page 14 we find 71° 30′ in the last column. Going across to the column having L Cos at the bottom we read 9.5015. The difference for 1′ is 3.8 and hence for 3′ it is $3 \times 3.8 = 11$ approximately. Since L Cos decreases when the angle increases from 71° 30′ to 71° 40′ we subtract the correction. The final result is

$$\log \cos 71° 33′ = 9.5004 - 10.$$

4. To find the acute angle A, given

$$\log \cot A = 8.9843 - 10.$$

On page 13 in the column having L Cot at the bottom, we find 8.9966 and 8.9836. Hence A lies between the corresponding angles 84° 20′ and 84° 30′. The difference in the logarithms is (disregarding the decimal point) $9966 - 9843 = 123$; since the difference for 1′ is 13.0, the correction to the angle is $123/13.0 = 9′$. Hence

$$A = 84° 29′.$$

Table V

13. Angles near 0° or 90°. A glance at Table VI shows that for small angles, from 0° to 2° or further, the differences in log sin, log tan, and log cot are large. It follows that interpolation will not be very accurate. The same remark applies for angles from 90° to 88° or further, for log cos, log tan, and log cot. On the other hand the differences are so small for log cos when angles are near zero that when the function is given, the angle is not well determined. For example, $\log \cos A = 9.99997 - 10$ for all angles from 0° 37′ to 0° 43′. On this account, when a small angle is to be found it is desirable to use a formula, if possible, which will give the sine, tangent, or cotangent of the angle. Similarly,

to determine an angle near 90° we should avoid a formula which gives its sine, but use one giving its cosine or tangent.

To increase the accuracy of interpolation for angles near 0° or 90° we use the special Table V*b* (pages 22–24). This gives the values of log sin for angles at intervals of 10″ from 0° to 3°. For angles from 0° to 3° we can find the values of log cos and log tan from the formulas

$$\log \cos A = 10 - C - 10,$$
$$\log \tan A = \log \sin A + C,$$

where C is a correction which is given in the Table. This formula gives an error of at most 1 in the last figure of the mantissa. For an angle from 87° to 90° use the cofunction of the complementary angle.

Examples. — 1. To find log tan 0° 37′ 43″ by use of Table V*b*.

We find

$$\log \tan 0^\circ\, 37'\, 40'' = 8.03970 - 10,$$
$$\log \tan 0^\circ\, 37'\, 50'' = 8.04162 - 10.$$

The difference for 10″ is 192; the correction for 3″ is

$$3/10 \times 192 = 57.6 = 58 \text{ approximately.}$$

Hence $$\log \tan 0^\circ\, 37'\, 43'' = 8.04028 - 10.$$

2. To find B, given log tan B = 2.26170.

The angle is near 90°. Let A be its complement, $A = 90^\circ - B$. Then

$$\log \cot A = 2.26170.$$

Hence

$$\log \tan A = 10 - \log \cot A - 10$$
$$= 7.73830 - 10.$$

From Table V*b*,

$$\log \tan 0^\circ\, 18'\, 40'' = 7.73480 - 10,$$
$$\log \tan 0^\circ\, 18'\, 50'' = 7.73866 - 10.$$

By interpolation we find

$$A = 0^\circ\, 18'\, 49.07''.$$

Hence

$$B = 89^\circ\, 41'\, 10.93''.$$

14. Interpolation by Table V*a*. Interpolation in Tables V*b* or VI may be avoided and higher accuracy attained by use of Table V*a*.

3. To find log tan 0° 37′ 43″ by means of Table V*a*.

We have the formula log tan A = log A' + T, where A' is the number of minutes in the angle; here $A' = 37.717$. Then, by Table VII,

$$\log A' = 1.57654$$

and by Table V*a*

$$T = 6.46374 - 10.$$

Hence

$$\log \tan 0° 37' 43'' = 8.04028 - 10.$$

4. To find A if log tan A = 2.26170, by Table V*a*.

The angle is near 90°. We are therefore to use the formula log cot $A = T_1 + \log A_1'$, where $A_1' = 90° - A$ expressed in minutes. We have

$$\log \cot A = 7.73830 - 10.$$

From Table VI, $A = 89° 41'$ approximately. Hence $A_1' = 19'$ approximately. From Table V*a*

$$T_1 = 6.46373 - 10.$$

Since

$$\log A_1' = \log \cot A - T_1$$

we have

$$\log A_1' = 1.27457.$$

From Table VII

$$A_1' = 18.818'.$$

Hence

$$A_1 = 18' 49.08'',$$
$$A = 90° - A_1 = 89° 41' 10.92''.$$

Table VI. Five-Place Logarithms of Functions

15. Five-place logarithms of functions. Table VI is a five-place table of the logarithms of functions, with angles given at intervals of 1′. On each page the number of degrees in the angle is read at the top or bottom, the number of minutes at the left or right; interpolation is necessary for parts of a minute. The angles 0° to 44° are found at the tops of the pages, 89° to 45° at the bottoms.

Examples.—1. To find log sin and log cot of the angle $23° 41' 37''$.

On page 50, which has 23° printed at the top, we find

$$\log \sin 23° 41' = 9.60388, \quad \log \sin 23° 42' = 9.60417.$$

The required log sin lies between these two, whose difference is 29 (see third column), the decimal point in the values of log sin being disregarded for simplicity in carrying out the interpolation. Since $1' = 60''$, the correction for $37''$ is 37/60 of 29. This may be found by use of the Prop. Pts. tables. In the column headed 29 we find the correction for $30''$ to be 14.5, and for $7''$ to be 3.4; thus the total correction is $14.5 + 3.4 = 18$. Since log sin increases as the angle increases from $23° 41'$ to $23° 42'$ the correction is added. Thus we find

$$\log \sin 23° 41' 37'' = 9.60406 - 10.$$

Similarly the correction for log cot is $17.0 + 4.0 = 21$. Since log cot decreases the correction is subtracted, and we get

$$\log \cot 23° 41' 37'' = 10.35770 - 10.$$

2. To find log tan and log cos of the angle $54° 57' 42''$.

On page 62, which has 54° at the bottom, we enter the column having log tan at the bottom, go up to the row having 57 in the last column, and find

$$\log \tan 54° 57' = 10.15397.$$

To interpolate, we note that the difference of successive values of log tan is 27. The correction for $40''$ is 18.0; for $2''$ it is 1/10 of that for $20''$; thus for $42''$ it is $18.0 + 0.9 = 19$. Since log tan increases when the angle increases, this is added and we get

$$\log \tan 54° 57' 42'' = 10.15416 - 10.$$

Similarly the correction for log cos is $12.0 + 0.6 = 13$; since log cos decreases, we have

$$\log \cos 54° 57' 42'' = 9.75900 - 10.$$

3. To find the acute angle A, given

$$\log \cos A = 8.77990 - 10.$$

On page 28, in the column having L Cos at the bottom 8.78152 and 8.77943 correspond to angles $86° 32'$ and $86° 33'$. Hence A lies between these angles. The difference $78152 - 77990 = 162$;

the tabular difference in the third column is 209. Hence the correction to the angle 86° 32′ is 162/209 of 60″. In the Prop. Pts. tables we find in the column headed 209 in the 40″ row 139.3; the difference 162 − 139.3 = 22.7 is nearly equal to the number in the 7″ row. Hence the correction is about 47″.

$$A = 86° 32′ 47″.$$

TABLE VII. FIVE-PLACE LOGARITHMS OF NUMBERS

16. Five-place logarithms of numbers. In this table on page 73 the *logarithms* are given correct to five decimal places for the integers from 1 to 100. Beginning on page 74 the *mantissas* are given correct to five decimal places for the integers from 1000 to 10009. The following examples illustrate the use of the table.

Examples. — 1. Given $\log N = 9.58065 - 10$, to find N.

We look in the five-place table for the mantissa .58065. We find on page 79 that it lies between two tabulated values, 58058 and 58070, being 7/12 of the way from the former to the latter. The desired number is 7/12 of the way from 38070 to 38080: the correction is $x = 7/12 \times 10 = 6$, and thus we get 38076. Since the characteristic is − 1, the decimal point precedes the 3, and we have

$$\begin{array}{ccccc} & & N & \log N & \\ 10 & \left[x \left[\begin{array}{ll} 38070 & 58058 \\ & 58065 \end{array} \right] 7 \right] & & & 12 \\ & & 38080 & 58070 & \end{array}$$

$$N = .38076.$$

The interpolation could have been accomplished by use of the Prop. Pts. table in the margin on page 79. The tabular difference is 58070 − 58058 = 12; the partial difference is 58065 − 58058 = 7. In the Prop. Pts. column headed 12, we find a number as near 7 as possible; it is 7.2; this occurs in row 6, which gives the correction. The interpolation should be done mentally.

2. To find log 4680 to five places.

Turn to Table VII (p. 81). In column N go down to row 468 and in column 0 find 67025. The decimal point is to be placed before the 6 to give the mantissa. Since the characteristic is 3, we have

$$\log 4680 = 3.67025.$$

3. To find log .4691 to five places.

On page 81 in row 469 and column 1 we find 127. This is to be preceded by the first two digits 67 of log 4680, giving 67127. Since the characteristic is -1, we have the result

$$\log .4691 = 9.67127 - 10.$$

4. To find log .04679 to five places.

On page 81, in row 467 and column 9 we find *015. If it were not for the *, we would place the two digits 66 of column 0 before these three, but the * indicates a change to 67 which occurs in the following row. The characteristic being -2, we have

$$\log .04679 = 8.67015 - 10.$$

5. To find log 15897 to five places.

From page 75 of the Tables we form the little table shown to the right. We must interpolate. The required logarithm is .7 of the way from 20112 to 20140. Hence we must add to the former the *correction* found by taking .7 of the difference $20140 - 20112 = 28$, that is, $.7 \times 28 = 19.6 = 20$ approximately. This correction could be found by looking in the Prop. Pts. table on the margin of page 75, in the Table, in column 28 and row 7, where we find 19.6. The interpolated value of log N is therefore $20112 + 20 = 20132$. Putting in the decimal point, and observing that the characteristic is 4, we have

N	log N
1589.0	20112
1589.7	
1590.0	20140

$$\log 15897 = 4.20132.$$

Examples showing the use of Tables III and VII

17. Products and quotients found by use of logarithms. We are now ready to use the fundamental laws of logarithms (§ **3**) in computations. To compute a product we find the logarithms of the factors, add them to get the logarithm of the product, then find in a table the number of which that is the logarithm.

Examples. — 1. To find $N = 3.728 \times .006378$ by use of four-place logarithms.

$$\begin{aligned} \log 3.728 &= 0.5714 \\ \log .006378 &= 7.8047 - 10 \\ \log N &= 8.3761 - 10 \\ N &= .02378. \end{aligned}$$

To compute a quotient we use Law II (§ **3**). We find the logarithms of the numerator and denominator, and subtract the latter from the former, getting the logarithm of the quotient. The number of which this is the logarithm is found in the Tables; it is the required quotient.

2. To find $N = \dfrac{42.73}{3697}$ by use of a four-place table of logarithms.

The characteristic of log 42.73 is written as $11 - 10$ so that the subtraction will be possible without use of a negative sign except with the -10.

$$\begin{aligned} \log 42.73 &= 11.6307 - 10 \\ \log 3697 &= 3.5678 \\ \log N &= 8.0629 - 10 \\ N &= .01156. \end{aligned}$$

3. To find $x = \dfrac{.38275 \times .048293}{.062191 \times 8346.8}$ by use of a five-place table of logarithms.

Calling the numerator N and the denominator D, we carry out the computation as follows:

$$\begin{aligned} \log .38275 &= 9.58292 - 10 \\ \log .048293 &= 8.68389 - 10 \\ \log N &= 18.26681 - 20 \\ \log D &= 12.71525 - 10 \\ \log x &= 5.55156 - 10 \end{aligned} \qquad \begin{aligned} \log .062191 &= 8.79373 - 10 \\ \log 8346.8 &= 3.92152 \\ \log D &= 12.71525 - 10 \\ \\ x &= .000035609 \end{aligned}$$

18. Cologarithms. Division may be carried out in a slightly different way. Instead of subtracting the logarithm of the denominator, we may add the negative of that loga-

rithm. When the latter is written so that the decimal part is positive it is called the *cologarithm* of the number. Thus

$$\operatorname{colog} N = -\log N,$$

and the law for division becomes

$$\log \frac{M}{N} = \log M + \operatorname{colog} N.$$

The following examples will show how the cologarithm is found.

Examples. — 1. To find colog 376.4 to four places.

We find log 376.4 = 2.5757. We get the cologarithm by adding the negative of this to 10.0000 − 10:

$$\begin{aligned} & 10.0000 - 10 \\ -\log 376.4 = & -2.5757 \\ \operatorname{colog} 376.4 = & \quad 7.4243 - 10 \end{aligned}$$

2. To find colog .006259 to five places.

$$\begin{aligned} & 10.00000 - 10 \\ -\log .006259 = & -7.79650 + 10 \\ \operatorname{colog} .006259 = & \quad 2.20350 \end{aligned}$$

It is seen that the cologarithm may be found by starting at the left of the logarithm and subtracting each digit from 9 until we come to the last which is different from zero; this one is subtracted from 10 and the subsequent digits of the cologarithm are 0. Using this rule it is easy to write down the cologarithm directly from the Table, care being taken to include the characteristic. This work must be done mentally if cologarithms are to be used to advantage.

Example 3 of the preceding section would be solved by use of cologarithms as follows:

$$\begin{aligned} \log .38275 &= 9.58292 - 10 \\ \log .048293 &= 8.68389 - 10 \\ \operatorname{colog} .062191 &= 1.20627 \\ \operatorname{colog} 8346.8 &= 6.07848 - 10 \\ \log x &= 25.55156 - 30 \\ x &= .000035609 \end{aligned}$$

19. Powers and roots. The third law of logarithms (§ **3**) enables us to find a power of a number. We take the logarithm of the number, multiply it by the exponent, getting the logarithm of the power, and find the number corresponding to that logarithm.

Example. — To find $x = (.3728)^5$.

Using a four-place table we have

$$\log .3728 = 9.5714 - 10;$$

multiplying by 5 gives

$$\log x = 47.8570 - 50,$$
$$x = .007194.$$

The student should also solve this problem by use of five-place tables and obtain

$$x = .0072012.$$

The fourth law of logarithms (§ **3**) is used in extracting roots. To find the rth root of a number, take the logarithm of the number, divide it by r to obtain the logarithm of the rth root, and find the corresponding number.

Example. — To find $\sqrt{.3728}$; $\sqrt[3]{.3728}$.

Using five-place tables we have

$$\log .3728 = 19.57148 - 20;$$

dividing by 2 gives

$$\log \sqrt{.3728} = 9.78574 - 10,$$
$$\sqrt{.3728} = .61057.$$

Also

$$\log .3728 = 29.57148 - 30;$$

dividing by 3 gives

$$\log \sqrt[3]{.3728} = 9.85716 - 10,$$
$$\sqrt[3]{.3728} = .71972.$$

We wrote the negative characteristic in each problem in such a way that after the division the only negative part of the logarithm was -10.

20. Computations involving negative numbers. We have remarked that negative numbers do not have logarithms. To obtain a product or quotient involving negative numbers, we may find the numerical value by disregarding the signs, then subsequently prefix the proper sign to the result. If there was an even number of negative factors, the sign should be $+$, if an odd number it should be $-$.

TABLE VIII. CONSTANTS WITH THEIR LOGARITHMS

21. Logarithms of constants. This table gives, on page 88, the values of a number of important constants which enter into trigonometric computations, together with the logarithms of these constants. No explanation of this table is necessary.

TABLE IX. NATURAL LOGARITHMS OF NUMBERS

22. Change of base of logarithms. In a note at the end of § **4**, we remarked that bases of logarithms other than 10 may be used. How can we find the logarithm of a number N to a base b, if its logarithm to a base a is known? We may arrive at the answer as follows:

By definition

$$b^{\log_b N} = N.$$

Take the logarithm of each number to the base a, using the third law of logarithms, § **3**, to simplify the left member. We find that

$$\log_b N \cdot \log_a b = \log_a N.$$

Hence

$$\log_b N = \frac{\log_a N}{\log_a b},$$

which answers our question.

If in this formula we substitute $N = a$, and observe that $\log_a a = 1$, we have

$$\log_b a = \frac{1}{\log_a b}.$$

Hence the preceding formula is equivalent to

$$\log_b N = \log_a N \cdot \log_b a.$$

If we take $a = 10$, $b = e$, where e is the base of natural logarithms (§ **1**), we have the most important special case,

$$\log_e N = \frac{\log_{10} N}{\log_{10} e} = \frac{\log_{10} N}{.43429} = 2.3026 \log_{10} N.$$

23. Explanation of Table. Table IX gives the *natural* logarithms of numbers from 1.00 to 10.09 correct to five places of decimals. The note at the top of page 94 explains how to find the logarithm of a number which does not come within the range of this table. The laws for finding the *characteristic* as given for base 10 do *not* hold for this table.

Examples. — 1. Find the value of $\log_e 4.06$ to five places.

On page 94, in row 4.0 and column 6 we find *0118. The * indicates a change in the first two digits of the logarithm from 1.3 to 1.4 so that we have

$$\log_e 4.06 = 1.40118.$$

2. Find the value of $\log_e 406$ to five places.

Since 406 does not come within the range of our table, it is necessary for us to shift the decimal point until we get a number which does occur in the table. We note that

$$406 = 10^2 \cdot 4.06.$$

Hence
$$\begin{aligned} \log_e 406 &= \log_e 10^2 + \log_e 4.06. \\ &= 2 \log_e 10 + \log_e 4.06 \\ &= 2(2.30259) + 1.40118 \\ \log_e 406 &= 6.00636. \end{aligned}$$

Interpolation in Table IX is carried out exactly as in Tables III and VII.

It should be noted that Table IX is also a *table of exponentials.* For by the definition of logarithms as given in § **1**

$$e^{\log_e N} = N,$$

so that we can find the value of e^x by using

$$x = \log_e N$$

and finding N from the Table.

Example. — Find the value of $e^{1.40118}$.

Here $\log_e N = 1.40118$. From the Table

$$N = 4.06,$$

so that

$$e^{1.40118} = 4.06.$$

FOUR-PLACE TABLES

N	0	1	2	3	4	5	6	7	8	9
1.0	1.000	1.020	1.040	1.061	1.082	1.103	1.124	1.145	1.166	1.188
1.1	1.210	1.232	1.254	1.277	1.300	1.323	1.346	1.369	1.392	1.416
1.2	1.440	1.464	1.488	1.513	1.538	1.563	1.588	1.613	1.638	1.664
1.3	1.690	1.716	1.742	1.769	1.796	1.823	1.850	1.877	1.904	1.932
1.4	1.960	1.988	2.016	2.045	2.074	2.103	2.132	2.161	2.190	2.220
1.5	2.250	2.280	2.310	2.341	2.372	2.403	2.434	2.465	2.496	2.528
1.6	2.560	2.592	2.624	2.657	2.690	2.723	2.756	2.789	2.822	2.856
1.7	2.890	2.924	2.958	2.993	3.028	3.063	3.098	3.133	3.168	3.204
1.8	3.240	3.276	3.312	3.349	3.386	3.423	3.460	3.497	3.534	3.572
1.9	3.610	3.648	3.686	3.725	3.764	3.803	3.842	3.881	3.920	3.960
2.0	4.000	4.040	4.080	4.121	4.162	4.203	4.244	4.285	4.326	4.368
2.1	4.410	4.452	4.494	4.537	4.580	4.623	4.666	4.709	4.752	4.796
2.2	4.840	4.884	4.928	4.973	5.018	5.063	5.108	5.153	5.198	5.244
2.3	5.290	5.336	5.382	5.429	5.476	5.523	5.570	5.617	5.664	5.712
2.4	5.760	5.808	5.856	5.905	5.954	6.003	6.052	6.101	6.150	6.200
2.5	6.250	6.300	6.350	6.401	6.452	6.503	6.554	6.605	6.656	6.708
2.6	6.760	6.812	6.864	6.917	6.970	7.023	7.076	7.129	7.182	7.236
2.7	7.290	7.344	7.398	7.453	7.508	7.563	7.618	7.673	7.728	7.784
2.8	7.840	7.896	7.952	8.009	8.066	8.123	8.180	8.237	8.294	8.352
2.9	8.410	8.468	8.526	8.585	8.644	8.703	8.762	8.821	8.880	8.940
3.0	9.000	9.060	9.120	9.181	9.242	9.303	9.364	9.425	9.486	9.548
3.1	9.610	9.672	9.734	9.797	9.860	9.923	9.986	10.05	10.11	10.18
3.2	10.24	10.30	10.37	10.43	10.50	10.56	10.63	10.69	10.76	10.82
3.3	10.89	10.96	11.02	11.09	11.16	11.22	11.29	11.36	11.42	11.49
3.4	11.56	11.63	11.70	11.76	11.83	11.90	11.97	12.04	12.11	12.18
3.5	12.25	12.32	12.39	12.46	12.53	12.60	12.67	12.74	12.82	12.89
3.6	12.96	13.03	13.10	13.18	13.25	13.32	13.40	13.47	13.54	13.62
3.7	13.69	13.76	13.84	13.91	13.99	14.06	14.14	14.21	14.29	14.36
3.8	14.44	14.52	14.59	14.67	14.75	14.82	14.90	14.98	15.05	15.13
3.9	15.21	15.29	15.37	15.44	15.52	15.60	15.68	15.76	15.84	15.92
4.0	16.00	16.08	16.16	16.24	16.32	16.40	16.48	16.56	16.65	16.73
4.1	16.81	16.89	16.97	17.06	17.14	17.22	17.31	17.39	17.47	17.56
4.2	17.64	17.72	17.81	17.89	17.98	18.06	18.15	18.23	18.32	18.40
4.3	18.49	18.58	18.66	18.75	18.84	18.92	19.01	19.10	19.18	19.27
4.4	19.36	19.45	19.54	19.62	19.71	19.80	19.89	19.98	20.07	20.16
4.5	20.25	20.34	20.43	20.52	20.61	20.70	20.79	20.88	20.98	21.07
4.6	21.16	21.25	21.34	21.44	21.53	21.62	21.72	21.81	21.90	22.00
4.7	22.09	22.18	22.28	22.37	22.47	22.56	22.66	22.75	22.85	22.94
4.8	23.04	23.14	23.23	23.33	23.43	23.52	23.62	23.72	23.81	23.91
4.9	24.01	24.11	24.21	24.30	24.40	24.50	24.60	24.70	24.80	24.90
5.0	25.00	25.10	25.20	25.30	25.40	25.50	25.60	25.70	25.81	25.91
5.1	26.01	26.11	26.21	26.32	26.42	26.52	26.63	26.73	26.83	26.94
5.2	27.04	27.14	27.25	27.35	27.46	27.56	27.67	27.77	27.88	27.98
5.3	28.09	28.20	28.30	28.41	28.52	28.62	28.73	28.84	28.94	29.05
5.4	29.16	29.27	29.38	29.48	29.59	29.70	29.81	29.92	30.03	30.14

N	0	1	2	3	4	5	6	7	8	9
5.5	30.25	30.36	30.47	30.58	30.69	30.80	30.91	31.02	31.14	31.25
5.6	31.36	31.47	31.58	31.70	31.81	31.92	32.04	32.15	32.26	32.38
5.7	32.49	32.60	32.72	32.83	32.95	33.06	33.18	33.29	33.41	33.52
5.8	33.64	33.76	33.87	33.99	34.11	34.22	34.34	34.46	34.57	34.69
5.9	34.81	34.93	35.05	35.16	35.28	35.40	35.52	35.64	35.76	35.88
6.0	36.00	36.12	36.24	36.36	36.48	36.60	36.72	36.84	36.97	37.09
6.1	37.21	37.33	37.45	37.58	37.70	37.82	37.95	38.07	38.19	38.32
6.2	38.44	38.56	38.69	38.81	38.94	39.06	39.19	39.31	39.44	39.56
6.3	39.69	39.82	39.94	40.07	40.20	40.32	40.45	40.58	40.70	40.83
6.4	40.96	41.09	41.22	41.34	41.47	41.60	41.73	41.86	41.99	42.12
6.5	42.25	42.38	42.51	42.64	42.77	42.90	43.03	43.16	43.30	43.43
6.6	43.56	43.69	43.82	43.96	44.09	44.22	44.36	44.49	44.62	44.76
6.7	44.89	45.02	45.16	45.29	45.43	45.56	45.70	45.83	45.97	46.10
6.8	46.24	46.38	46.51	46.65	46.79	46.92	47.06	47.20	47.33	47.47
6.9	47.61	47.75	47.89	48.02	48.16	48.30	48.44	48.58	48.72	48.86
7.0	49.00	49.14	49.28	49.42	49.56	49.70	49.84	49.98	50.13	50.27
7.1	50.41	50.55	50.69	50.84	50.98	51.12	51.27	51.41	51.55	51.70
7.2	51.84	51.98	52.13	52.27	52.42	52.56	52.71	52.85	53.00	53.14
7.3	53.29	53.44	53.58	53.73	53.88	54.02	54.17	54.32	54.46	54.61
7.4	54.76	54.91	55.06	55.20	55.35	55.50	55.65	55.80	55.95	56.10
7.5	56.25	56.40	56.55	56.70	56.85	57.00	57.15	57.30	57.46	57.61
7.6	57.76	57.91	58.06	58.22	58.37	58.52	58.68	58.83	58.98	59.14
7.7	59.29	59.44	59.60	59.75	59.91	60.06	60.22	60.37	60.53	60.68
7.8	60.84	61.00	61.15	61.31	61.47	61.62	61.78	61.94	62.09	62.25
7.9	62.41	62.57	62.73	62.88	63.04	63.20	63.36	63.52	63.68	63.84
8.0	64.00	64.16	64.32	64.48	64.64	64.80	64.96	65.12	65.29	65.45
8.1	65.61	65.77	65.93	66.10	66.26	66.42	66.59	66.75	66.91	67.08
8.2	67.24	67.40	67.57	67.73	67.90	68.06	68.23	68.39	68.56	68.72
8.3	68.89	69.06	69.22	69.39	69.56	69.72	69.89	70.06	70.22	70.39
8.4	70.56	70.73	70.90	71.06	71.23	71.40	71.57	71.74	71.91	72.08
8.5	72.25	72.42	72.59	72.76	72.93	73.10	73.27	73.44	73.62	73.79
8.6	73.96	74.13	74.30	74.48	74.65	74.82	75.00	75.17	75.34	75.52
8.7	75.69	75.86	76.04	76.21	76.39	76.56	76.74	76.91	77.08	77.26
8.8	77.44	77.62	77.79	77.97	78.15	78.32	78.50	78.68	78.85	79.03
8.9	79.21	79.39	79.57	79.74	79.92	80.10	80.28	80.46	80.64	80.82
9.0	81.00	81.18	81.36	81.54	81.72	81.90	82.08	82.26	82.45	82.63
9.1	82.81	82.99	83.17	83.36	83.54	83.72	83.91	84.09	84.27	84.46
9.2	84.64	84.82	85.01	85.19	85.38	85.56	85.75	85.93	86.12	86.30
9.3	86.49	86.68	86.86	87.05	87.24	87.42	87.61	87.80	87.98	88.17
9.4	88.36	88.55	88.74	88.92	89.11	89.30	89.49	89.68	89.87	90.06
9.5	90.25	90.44	90.63	90.82	91.01	91.20	91.39	91.58	91.78	91.97
9.6	92.16	92.35	92.54	92.74	92.93	93.12	93.32	93.51	93.70	93.90
9.7	94.09	94.28	94.48	94.67	94.87	95.06	95.26	95.45	95.65	95.84
9.8	96.04	96.24	96.43	96.63	96.83	97.02	97.22	97.42	97.61	97.81
9.9	98.01	98.21	98.41	98.60	98.80	99.00	99.20	99.40	99.60	99.80

Degrees	Radians	Sin	Cos	Tan	Cot	Sec	Csc		
0° 00′	.0000	.0000	1.0000	.0000	——	1.000	——	1.5708	**90° 00′**
10	029	029	000	029	343.8	000	343.8	679	50
20	058	058	000	058	171.9	000	171.9	650	40
30	.0087	.0087	1.0000	.0087	114.6	1.000	114.6	1.5621	30
40	116	116	.9999	116	85.94	000	85.95	592	20
50	145	145	999	145	68.75	000	68.76	563	10
1° 00′	.0175	.0175	.9998	.0175	57.29	1.000	57.30	1.5533	**89° 00′**
10	204	204	998	204	49.10	000	49.11	504	50
20	233	233	997	233	42.96	000	42.98	475	40
30	.0262	.0262	.9997	.0262	38.19	1.000	38.20	1.5446	30
40	291	291	996	291	34.37	000	34.38	417	20
50	320	320	995	320	31.24	001	31.26	388	10
2° 00′	.0349	.0349	.9994	.0349	28.64	1.001	28.65	1.5359	**88° 00′**
10	378	378	993	378	26.43	001	26.45	330	50
20	407	407	992	407	24.54	001	24.56	301	40
30	.0436	.0436	.9990	.0437	22.90	1.001	22.93	1.5272	30
40	465	465	989	466	21.47	001	21.49	243	20
50	495	494	988	495	20.21	001	20.23	213	10
3° 00′	.0524	.0523	.9986	.0524	19.08	1.001	19.11	1.5184	**87° 00′**
10	553	552	985	553	18.07	002	18.10	155	50
20	582	581	983	582	17.17	002	17.20	126	40
30	.0611	.0610	.9981	.0612	16.35	1.002	16.38	1.5097	30
40	640	640	980	641	15.60	002	15.64	068	20
50	669	669	978	670	14.92	002	14.96	039	10
4° 00′	.0698	.0698	.9976	.0699	14.30	1.002	14.34	1.5010	**86° 00′**
10	727	727	974	729	13.73	003	13.76	981	50
20	756	756	971	758	13.20	003	13.23	952	40
30	.0785	.0785	.9969	.0787	12.71	1.003	12.75	1.4923	30
40	814	814	967	816	12.25	003	12.29	893	20
50	844	843	964	846	11.83	004	11.87	864	10
5° 00′	.0873	.0872	.9962	.0875	11.43	1.004	11.47	1.4835	**85° 00′**
10	902	901	959	904	11.06	004	11.10	806	50
20	931	929	957	934	10.71	004	10.76	777	40
30	.0960	.0958	.9954	.0963	10.39	1.005	10.43	1.4748	30
40	989	987	951	992	10.08	005	10.13	719	20
50	.1018	.1016	948	.1022	9.788	005	9.839	690	10
6° 00′	.1047	.1045	.9945	.1051	9.514	1.006	9.567	1.4661	**84° 00′**
10	076	074	942	080	9.255	006	9.309	632	50
20	105	103	939	110	9.010	006	9.065	603	40
30	.1134	.1132	.9936	.1139	8.777	1.006	8.834	1.4573	30
40	164	161	932	169	8.556	007	8.614	544	20
50	193	190	929	198	8.345	007	8.405	515	10
7° 00′	.1222	.1219	.9925	.1228	8.144	1.008	8.206	1.4486	**83° 00′**
10	251	248	922	257	7.953	008	8.016	457	50
20	280	276	918	287	7.770	008	7.834	428	40
30	.1309	.1305	.9914	.1317	7.596	1.009	7.661	1.4399	30
40	338	334	911	346	7.429	009	7.496	370	20
50	367	363	907	376	7.269	009	7.337	341	10
8° 00′	.1396	.1392	.9903	.1405	7.115	1.010	7.185	1.4312	**82° 00′**
10	425	421	899	435	6.968	010	7.040	283	50
20	454	449	894	465	6.827	011	6.900	254	40
30	.1484	.1478	.9890	.1495	6.691	1.011	6.765	1.4224	30
40	513	507	886	524	6.561	012	6.636	195	20
50	542	536	881	554	6.435	012	6.512	166	10
9° 00′	.1571	.1564	.9877	.1584	6.314	1.012	6.392	1.4137	**81° 00′**
		Cos	Sin	Cot	Tan	Csc	Sec	Radians	Degrees

Degrees	Radians	Sin	Cos	Tan	Cot	Sec	Csc		
9° 00′	.1571	.1564	.9877	.1584	6.314	1.012	6.392	1.4137	**81° 00′**
10	600	593	872	614	197	013	277	108	50
20	629	622	868	644	084	013	166	079	40
30	.1658	.1650	.9863	.1673	5.976	1.014	6.059	1.4050	30
40	687	679	858	703	871	014	5.955	1.4021	20
50	716	708	853	733	769	015	855	992	10
10° 00′	.1745	.1736	.9848	.1763	5.671	1.015	5.759	1.3963	**80° 00′**
10	774	765	843	793	576	016	665	934	50
20	804	794	838	823	485	016	575	904	40
30	.1833	.1822	.9833	.1853	5.396	1.017	5.487	1.3875	30
40	862	851	827	883	309	018	403	846	20
50	891	880	822	914	226	018	320	817	10
11° 00′	.1920	.1908	.9816	.1944	5.145	1.019	5.241	1.3788	**79° 00′**
10	949	937	811	974	066	019	164	759	50
20	978	965	805	.2004	4.989	020	089	730	40
30	.2007	.1994	.9799	.2035	4.915	1.020	5.016	1.3701	30
40	036	.2022	793	065	843	021	4.945	672	20
50	065	051	787	095	773	022	876	643	10
12 00′	.2094	.2079	.9781	.2126	4.705	1.022	4.810	1.3614	**78° 00′**
10	123	108	775	156	638	023	745	584	50
20	153	136	769	186	574	024	682	555	40
30	.2182	.2164	.9763	.2217	4.511	1.024	4.620	1.3526	30
40	211	193	757	247	449	025	560	497	20
50	240	221	750	278	390	026	502	468	10
13° 00′	.2269	.2250	.9744	.2309	4.331	1.026	4.445	1.3439	**77° 00′**
10	298	278	737	339	275	027	390	410	50
20	327	306	730	370	219	028	336	381	40
30	.2356	.2334	.9724	.2401	4.165	1.028	4.284	1.3352	30
40	385	363	717	432	113	029	232	323	20
50	414	391	710	462	061	030	182	294	10
14° 00′	.2443	.2419	.9703	.2493	4.011	1.031	4.134	1.3265	**76° 00′**
10	473	447	696	524	3.962	031	086	235	50
20	502	476	689	555	914	032	039	206	40
30	.2531	.2504	.9681	.2586	3.867	1.033	3.994	1.3177	30
40	560	532	674	617	821	034	950	148	20
50	589	560	667	648	776	034	906	119	10
15° 00′	.2618	.2588	.9659	.2679	3.732	1.035	3.864	1.3090	**75° 00′**
10	647	616	652	711	689	036	822	061	50
20	676	644	644	742	647	037	782	032	40
30	.2705	.2672	.9636	.2773	3.606	1.038	3.742	1.3003	30
40	734	700	628	805	566	039	703	974	20
50	763	728	621	836	526	039	665	945	10
16° 00′	.2793	.2756	.9613	.2867	3.487	1.040	3.628	1.2915	**74° 00′**
10	822	784	605	899	450	041	592	886	50
20	851	812	596	931	412	042	556	857	40
30	.2880	.2840	.9588	.2962	3.376	1.043	3.521	1.2828	30
40	909	868	580	994	340	044	487	799	20
50	938	896	572	.3026	305	045	453	770	10
17° 00′	.2967	.2924	.9563	.3057	3.271	1.046	3.420	1.2741	**73° 00′**
10	996	952	555	089	237	047	388	712	50
20	.3025	979	546	121	204	048	357	683	40
30	.3054	.3007	.9537	.3153	3.172	1.048	3.326	1.2654	30
40	083	035	528	185	140	049	295	625	20
50	113	062	520	217	108	050	265	595	10
18° 00′	.3142	.3090	.9511	.3249	3.078	1.051	3.236	1.2566	**72° 00′**
		Cos	Sin	Cot	Tan	Csc	Sec	Radians	Degrees

Degrees	Radians	Sin	Cos	Tan	Cot	Sec	Csc		
18° 00′	.3142	.3090	.9511	.3249	3.078	1.051	3.236	1.2566	**72° 00′**
10	171	118	502	281	047	052	207	537	50
20	200	145	492	314	018	053	179	508	40
30	.3229	.3173	.9483	.3346	2.989	1.054	3.152	1.2479	30
40	258	201	474	378	960	056	124	450	20
50	287	228	465	411	932	057	098	421	10
19° 00′	.3316	.3256	.9455	.3443	2.904	1.058	3.072	1.2392	**71° 00′**
10	345	283	446	476	877	059	046	363	50
20	374	311	436	508	850	060	021	334	40
30	.3403	.3338	.9426	.3541	2.824	1.061	2.996	1.2305	30
40	432	365	417	574	798	062	971	275	20
50	462	393	407	607	773	063	947	246	10
20° 00′	.3491	.3420	.9397	.3640	2.747	1.064	2.924	1.2217	**70° 00′**
10	520	448	387	673	723	065	901	188	50
20	549	475	377	706	699	066	878	159	40
30	.3578	.3502	.9367	.3739	2.675	1.068	2.855	1.2130	30
40	607	529	356	772	651	069	833	101	20
50	636	557	346	805	628	070	812	072	10
21° 00′	.3665	.3584	.9336	.3839	2.605	1.071	2.790	1.2043	**69° 00′**
10	694	611	325	872	583	072	769	1.2014	50
20	723	638	315	906	560	074	749	985	40
30	.3752	.3665	.9304	.3939	2.539	1.075	2.729	1.1956	30
40	782	692	293	973	517	076	709	926	20
50	811	719	283	.4006	496	077	689	897	10
22° 00′	.3840	.3746	.9272	.4040	2.475	1.079	2.669	1.1868	**68° 00′**
10	869	773	261	074	455	080	650	839	50
20	898	800	250	108	434	081	632	810	40
30	.3927	.3827	.9239	.4142	2.414	1.082	2.613	1.1781	30
40	956	854	228	176	394	084	595	752	20
50	985	881	216	210	375	085	577	723	10
23° 00′	.4014	.3907	.9205	.4245	2.356	1.086	2.559	1.1694	**67° 00′**
10	043	934	194	279	337	088	542	665	50
20	072	961	182	314	318	089	525	636	40
30	.4102	.3987	.9171	.4348	2.300	1.090	2.508	1.1606	30
40	131	.4014	159	383	282	092	491	577	20
50	160	041	147	417	264	093	475	548	10
24° 00′	.4189	.4067	.9135	.4452	2.246	1.095	2.459	1.1519	**66° 00′**
10	218	094	124	487	229	096	443	490	50
20	247	120	112	522	211	097	427	461	40
30	.4276	.4147	.9100	.4557	2.194	1.099	2.411	1.1432	30
40	305	173	088	592	177	100	396	403	20
50	334	200	075	628	161	102	381	374	10
25° 00′	.4363	.4226	.9063	.4663	2.145	1.103	2.366	1.1345	**65° 00′**
10	392	253	051	699	128	105	352	316	50
20	422	279	038	734	112	106	337	286	40
30	.4451	.4305	.9026	.4770	2.097	1.108	2.323	1.1257	30
40	480	331	013	806	081	109	309	228	20
50	509	358	001	841	066	111	295	199	10
26° 00′	.4538	.4384	.8988	.4877	2.050	1.113	2.281	1.1170	**64° 00′**
10	567	410	975	913	035	114	268	141	50
20	596	436	962	950	020	116	254	112	40
30	.4625	.4462	.8949	.4986	2.006	1.117	2.241	1.1083	30
40	654	488	936	.5022	1.991	119	228	054	20
50	683	514	923	059	977	121	215	1.1025	10
27° 00′	.4712	.4540	.8910	.5095	1.963	1.122	2.203	1.0996	**63° 00′**
		Cos	Sin	Cot	Tan	Csc	Sec	Radians	Degrees

Degrees	Radians	Sin	Cos	Tan	Cot	Sec	Csc		
27° 00′	.4712	.4540	.8910	.5095	1.963	1.122	2.203	1.0996	**63° 00′**
10	741	566	897	132	949	124	190	966	50
20	771	592	884	169	935	126	178	937	40
30	.4800	.4617	.8870	.5206	1.921	1.127	2.166	1.0908	30
40	829	643	857	243	907	129	154	879	20
50	858	669	843	280	894	131	142	850	10
28° 00′	.4887	.4695	.8829	.5317	1.881	1.133	2.130	1.0821	**62° 00′**
10	916	720	816	354	.868	134	118	792	50
20	945	746	802	392	855	136	107	763	40
30	.4974	.4772	.8788	.5430	1.842	1.138	2.096	1.0734	30
40	.5003	797	774	467	829	140	085	705	20
50	032	823	760	505	816	142	074	676	10
29° 00′	.5061	.4848	.8746	.5543	1.804	1.143	2.063	1.0647	**61° 00′**
10	091	874	732	581	792	145	052	617	50
20	120	899	718	619	780	147	041	588	40
30	.5149	.4924	.8704	.5658	1.767	1.149	2.031	1.0559	30
40	178	950	689	696	756	151	020	530	20
50	207	975	675	735	744	153	010	501	10
30° 00′	.5236	.5000	.8660	.5774	1.732	1.155	2.000	1.0472	**60° 00′**
10	265	025	646	812	720	157	1.990	443	50
20	294	050	631	851	709	159	980	414	40
30	.5323	.5075	.8616	.5890	1.698	1.161	1.970	1.0385	30
40	352	100	601	930	686	163	961	356	20
50	381	125	587	969	.675	165	951	327	10
31° 00′	.5411	.5150	.8572	.6009	1.664	1.167	1.942	1.0297	**59° 00′**
10	440	175	557	048	653	169	932	268	50
20	469	200	542	088	643	171	923	239	40
30	.5498	.5225	.8526	.6128	1.632	1.173	1.914	1.0210	30
40	527	250	511	168	621	175	905	181	20
50	556	275	496	208	611	177	896	152	10
32° 00′	.5585	.5299	.8480	.6249	1.600	1.179	1.887	1.0123	**58° 00′**
10	614	324	465	289	590	181	878	094	50
20	643	348	450	330	580	184	870	065	40
30	.5672	.5373	.8434	.6371	1.570	1.186	1.861	1.0036	30
40	701	398	418	412	560	188	853	1.0007	20
50	730	422	403	453	550	190	844	977	10
33° 00′	.5760	.5446	.8387	.6494	1.540	1.192	1.836	.9948	**57° 00′**
10	789	471	371	536	530	195	828	919	50
20	818	495	355	577	520	197	820	890	40
30	.5847	.5519	.8339	.6619	1.511	1.199	1.812	.9861	30
40	876	544	323	661	501	202	804	832	20
50	905	568	307	703	1.492	204	796	803	10
34° 00′	.5934	.5592	.8290	.6745	1.483	1.206	1.788	.9774	**56° 00′**
10	963	616	274	787	473	209	781	745	50
20	992	640	258	830	464	211	773	716	40
30	.6021	.5664	.8241	.6873	1.455	1.213	1.766	.9687	30
40	050	688	225	916	446	216	758	657	20
50	080	712	208	959	437	218	751	628	10
35° 00′	.6109	.5736	.8192	.7002	1.428	1.221	1.743	.9599	**55° 00′**
10	138	760	175	046	419	223	736	570	50
20	167	783	158	089	411	226	729	541	40
30	.6196	.5807	.8141	.7133	1.402	1.228	1.722	.9512	30
40	225	831	124	177	.393	231	715	483	20
50	254	854	107	221	385	233	708	454	10
36° 00′	.6283	.5878	.8090	.7265	1.376	1.236	1.701	.9425	**54° 00′**
		Cos	Sin	Cot	Tan	Csc	Sec	Radians	Degrees

Degrees	Radians	Sin	Cos	Tan	Cot	Sec	Csc		
36° 00′	.6283	.5878	.8090	.7265	1.376	1.236	1.701	.9425	**54° 00′**
10	312	901	073	310	368	239	695	396	50
20	341	925	056	355	360	241	688	367	40
30	.6370	.5948	.8039	.7400	1.351	1.244	1.681	.9338	30
40	400	972	021	445	343	247	675	308	20
50	429	995	004	490	335	249	668	279	10
37° 00′	.6458	.6018	.7986	.7536	1.327	1.252	1.662	.9250	**53° 00′**
10	487	041	969	581	319	255	655	221	50
20	516	065	951	627	311	258	649	192	40
30	.6545	.6088	.7934	.7673	1.303	1.260	1.643	.9163	30
40	574	111	916	720	295	263	636	134	20
50	603	134	898	766	288	266	630	105	10
38° 00′	.6632	.6157	.7880	.7813	1.280	1.269	1.624	.9076	**52° 00′**
10	661	180	862	860	272	272	618	047	50
20	690	202	844	907	265	275	612	.9018	40
30	.6720	.6225	.7826	.7954	1.257	1.278	1.606	.8988	30
40	749	248	808	.8002	250	281	601	959	20
50	778	271	790	050	242	284	595	930	10
39° 00′	.6807	.6293	.7771	.8098	1.235	1.287	1.589	.8901	**51° 00′**
10	836	316	753	146	228	290	583	872	50
20	865	338	735	195	220	293	578	843	40
30	.6894	.6361	.7716	.8243	1.213	1.296	1.572	.8814	30
40	923	383	698	292	206	299	567	785	20
50	952	406	679	342	199	302	561	756	10
40° 00′	.6981	.6428	.7660	.8391	1.192	1.305	1.556	.8727	**50° 00′**
10	.7010	450	642	441	185	309	550	698	50
20	039	472	623	491	178	312	545	668	40
30	.7069	.6494	.7604	.8541	1.171	1.315	1.540	.8639	30
40	098	517	585	591	164	318	535	610	20
50	127	539	566	642	157	322	529	581	10
41° 00′	.7156	.6561	.7547	.8693	1.150	1.325	1.524	.8552	**49° 00′**
10	185	583	528	744	144	328	519	523	50
20	214	604	509	796	137	332	514	494	40
30	.7243	.6626	.7490	.8847	1.130	1.335	1.509	.8465	30
40	272	648	470	899	124	339	504	436	20
50	301	670	451	952	117	342	499	407	10
42° 00′	.7330	.6691	.7431	.9004	1.111	1.346	1.494	.8378	**48° 00′**
10	359	713	412	057	104	349	490	348	50
20	389	734	392	110	098	353	485	319	40
30	.7418	.6756	.7373	.9163	1.091	1.356	1.480	.8290	30
40	447	777	353	217	085	360	476	261	20
50	476	799	333	271	079	364	471	232	10
43° 00′	.7505	.6820	.7314	.9325	1.072	1.367	1.466	.8203	**47° 00′**
10	534	841	294	380	066	371	462	174	50
20	563	862	274	435	060	375	457	145	40
30	.7592	.6884	.7254	.9490	1.054	1.379	1.453	.8116	30
40	621	905	234	545	048	382	448	087	20
50	650	926	214	601	042	386	444	058	10
44° 00′	.7679	.6947	.7193	.9657	1.036	1.390	1.440	.8029	**46° 00′**
10	709	967	173	713	030	394	435	999	50
20	738	988	153	770	024	398	431	970	40
30	.7767	.7009	.7133	.9827	1.018	1.402	1.427	.7941	30
40	796	030	112	884	012	406	423	912	20
50	825	050	092	942	006	410	418	883	10
45° 00′	.7854	.7071	.7071	1.000	1.000	1.414	1.414	.7854	**45° 00′**
		Cos	Sin	Cot	Tan	Csc	Sec	Radians	Degrees

N	0	1	2	3	4	5	6	7	8	9	Proportional Parts								
											1	2	3	4	5	6	7	8	9
1.0	0000	043	086	128	170	212	253	294	334	374	4	8	12	17	21	25	Use direct interpolation for greater accuracy for numbers between 1.000 and 2.000		
1	414	453	492	531	569	607	645	682	719	755	4	8	11	15	19	23			
2	792	828	864	899	934	969	*004	*038	*072	*106	3	7	10	14	17	21			
3	1139	173	206	239	271	303	335	367	399	430	3	6	10	13	16	19			
4	461	492	523	553	584	614	644	673	703	732	3	6	9	12	15	18			
1.5	761	790	818	847	875	903	931	959	987	*014	3	6	8	11	14	17			
6	2041	068	095	122	148	175	201	227	253	279	3	5	8	11	13	16			
7	304	330	355	380	405	430	455	480	504	529	2	5	7	10	12	15			
8	553	577	601	625	648	672	695	718	742	765	2	5	7	9	12	14			
9	788	810	833	856	878	900	923	945	967	989	2	4	7	9	11	13			
2.0	3010	032	054	075	096	118	139	160	181	201	2	4	6	8	11	13	15	17	19
1	222	243	263	284	304	324	345	365	385	404	2	4	6	8	10	12	14	16	18
2	424	444	464	483	502	522	541	560	579	598	2	4	6	8	10	12	14	16	17
3	617	636	655	674	692	711	729	747	766	784	2	4	6	7	9	11	13	15	17
4	802	820	838	856	874	892	909	927	945	962	2	4	5	7	9	11	12	14	16
2.5	979	997	*014	*031	*048	*065	*082	*099	*116	*133	2	4	5	7	9	10	12	14	16
6	4150	166	183	200	216	232	249	265	281	298	2	3	5	7	8	10	11	13	15
7	314	330	346	362	378	393	409	425	440	456	2	3	5	6	8	9	11	12	14
8	472	487	502	518	533	548	564	579	594	609	2	3	5	6	8	9	11	12	14
9	624	639	654	669	683	698	713	728	742	757	1	3	4	6	7	9	10	12	13
3.0	771	786	800	814	829	843	857	871	886	900	1	3	4	6	7	9	10	11	13
1	914	928	942	955	969	983	997	*011	*024	*038	1	3	4	5	7	8	10	11	12
2	5051	065	079	092	105	119	132	145	159	172	1	3	4	5	7	8	9	11	12
3	185	198	211	224	237	250	263	276	289	302	1	3	4	5	7	8	9	11	12
4	315	328	340	353	366	378	391	403	416	428	1	2	4	5	6	8	9	10	11
3.5	441	453	465	478	490	502	514	527	539	551	1	2	4	5	6	7	9	10	11
6	563	575	587	599	611	623	635	647	658	670	1	2	4	5	6	7	8	10	11
7	682	694	705	717	729	740	752	763	775	786	1	2	4	5	6	7	8	9	11
8	798	809	821	832	843	855	866	877	888	899	1	2	3	5	6	7	8	9	10
9	911	922	933	944	955	966	977	988	999	*010	1	2	3	4	5	7	8	9	10
4.0	6021	031	042	053	064	075	085	096	107	117	1	2	3	4	5	6	8	9	10
1	128	138	149	160	170	180	191	201	212	222	1	2	3	4	5	6	7	8	9
2	232	243	253	263	274	284	294	304	314	325	1	2	3	4	5	6	7	8	9
3	335	345	355	365	375	385	395	405	415	425	1	2	3	4	5	6	7	8	9
4	435	444	454	464	474	484	493	503	513	522	1	2	3	4	5	6	7	8	9
4.5	532	542	551	561	571	580	590	599	609	618	1	2	3	4	5	6	7	8	9
6	628	637	646	656	665	675	684	693	702	712	1	2	3	4	5	6	7	7	8
7	721	730	739	749	758	767	776	785	794	803	1	2	3	4	5	6	7	7	8
8	812	821	830	839	848	857	866	875	884	893	1	2	3	4	5	6	7	7	8
9	902	911	920	928	937	946	955	964	972	981	1	2	3	4	4	5	6	7	8
5.0	990	998	*007	*016	*024	*033	*042	*050	*059	*067	1	2	3	3	4	5	6	7	8
1	7076	084	093	101	110	118	126	135	143	152	1	2	3	3	4	5	6	7	8
2	160	168	177	185	193	202	210	218	226	235	1	2	3	3	4	5	6	7	7
3	243	251	259	267	275	284	292	300	308	316	1	2	2	3	4	5	6	6	7
4	324	332	340	348	356	364	372	380	388	396	1	2	2	3	4	5	6	6	7
N	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	1	2	3	4	5	6	7	8	9

N	0	1	2	3	4	5	6	7	8	9	Proportional Parts		
											1 2 3	4 5 6	7 8 9
5.5	7404	412	419	427	435	443	451	459	466	474	1 2 2	3 4 5	5 6 7
6	482	490	497	505	513	520	528	536	543	551	1 2 2	3 4 5	5 6 7
7	559	566	574	582	589	597	604	612	619	627	1 1 2	3 4 5	5 6 7
8	634	642	649	657	664	672	679	686	694	701	1 1 2	3 4 4	5 6 7
9	709	716	723	731	738	745	752	760	767	774	1 1 2	3 4 4	5 6 7
6.0	782	789	796	803	810	818	825	832	839	846	1 1 2	3 4 4	5 6 6
1	853	860	868	875	882	889	896	903	910	917	1 1 2	3 3 4	5 6 6
2	924	931	938	945	952	959	966	973	980	987	1 1 2	3 3 4	5 5 6
3	993	*000	*007	*014	*021	*028	*035	*041	*048	*055	1 1 2	3 3 4	5 6 6
4	8062	069	075	082	089	096	102	109	116	122	1 1 2	3 3 4	5 5 6
6.5	129	136	142	149	156	162	169	176	182	189	1 1 2	3 3 4	5 5 6
6	195	202	209	215	222	228	235	241	248	254	1 1 2	3 3 4	5 5 6
7	261	267	274	280	287	293	299	306	312	319	1 1 2	3 3 4	5 5 6
8	325	331	338	344	351	357	363	370	376	382	1 1 2	3 3 4	4 5 6
9	388	395	401	407	414	420	426	432	439	445	1 1 2	3 3 4	4 5 6
7.0	451	457	463	470	476	482	488	494	500	506	1 1 2	3 3 4	4 5 6
1	513	519	525	531	537	543	549	555	561	567	1 1 2	3 3 4	4 5 6
2	573	579	585	591	597	603	609	615	621	627	1 1 2	3 3 4	4 5 6
3	633	639	645	651	657	663	669	675	681	686	1 1 2	2 3 4	4 5 5
4	692	698	704	710	716	722	727	733	739	745	1 1 2	2 3 4	4 5 5
7.5	751	756	762	768	774	779	785	791	797	802	1 1 2	2 3 3	4 5 5
6	808	814	820	825	831	837	842	848	854	859	1 1 2	2 3 3	4 4 5
7	865	871	876	882	887	893	899	904	910	915	1 1 2	2 3 3	4 4 5
8	921	927	932	938	943	949	954	960	965	971	1 1 2	2 3 3	4 4 5
9	976	982	987	993	998	*004	*009	*015	*020	*025	1 1 2	2 3 3	4 4 5
8.0	9031	036	042	047	053	058	063	069	074	079	1 1 2	2 3 3	4 4 5
1	085	090	096	101	106	112	117	122	128	133	1 1 2	2 3 3	4 4 5
2	138	143	149	154	159	165	170	175	180	186	1 1 2	2 3 3	4 4 5
3	191	196	201	206	212	217	222	227	232	238	1 1 2	2 3 3	4 4 5
4	243	248	253	258	263	269	274	279	284	289	1 1 2	2 3 3	4 4 5
8.5	294	299	304	309	315	320	325	330	335	340	1 1 2	2 3 3	4 4 5
6	345	350	355	360	365	370	375	380	385	390	1 1 2	2 3 3	4 4 5
7	395	400	405	410	415	420	425	430	435	440	1 1 2	2 3 3	4 4 5
8	445	450	455	460	465	469	474	479	484	489	0 1 1	2 2 3	3 4 4
9	494	499	504	509	513	518	523	528	533	538	0 1 1	2 2 3	3 4 4
9.0	542	547	552	557	562	566	571	576	581	586	0 1 1	2 2 3	3 4 4
1	590	595	600	605	609	614	619	624	628	633	0 1 1	2 2 3	3 4 4
2	638	643	647	652	657	661	666	671	675	680	0 1 1	2 2 3	3 4 4
3	685	689	694	699	703	708	713	717	722	727	0 1 1	2 2 3	3 4 4
4	731	736	741	745	750	754	759	763	768	773	0 1 1	2 2 3	3 4 4
9.5	777	782	786	791	795	800	805	809	814	818	0 1 1	2 2 3	3 4 4
6	823	827	832	836	841	845	850	854	859	863	0 1 1	2 2 3	3 4 4
7	868	872	877	881	886	890	894	899	903	908	0 1 1	2 2 3	3 4 4
8	912	917	921	926	930	934	939	943	948	952	0 1 1	2 2 3	3 3 4
9	956	961	965	969	974	978	983	987	991	996	0 1 1	2 2 3	3 3 4
N	0	1	2	3	4	5	6	7	8	9	1 2 3	4 5 6	7 8 9

TABLE IV

FOUR-PLACE LOGARITHMS OF TRIGONOMETRIC FUNCTIONS

NOTE 1. — For simplicity in printing, all characteristics have been increased by 10. Hence 10 must be subtracted from each tabulated value of a logarithm.

NOTE 2. — To avoid interpolating for angles between 0° and 3° or 87° and 90° use Tables V *a* or V *b*.

Angle	L Sin	d 1′	L Tan	c d 1′	L Cot	L Cos	d 1′	
0° 0′						10.0000		**90° 0′**
10′	7.4637		7.4637		12.5363	.0000	.0	50′
20′	.7648	301.1	.7648	301.1	.2352	.0000	.0	40′
30′	.9408	176.0	.9409	176.1	.0591	.0000	.0	30′
40′	8.0658	125.0	8.0658	124.9	11.9342	.0000	.0	20′
50′	.1627	96.9	.1627	96.9	.8373	.0000	.0	10′
1° 0′	8.2419	79.2	8.2419	79.2	11.7581	9.9999	.1	**89° 0′**
10′	.3088	66.9	.3089	67.0	.6911	.9999	.0	50′
20′	.3668	58.0	.3669	58.0	.6331	.9999	.0	40′
30′	.4179	51.1	.4181	51.2	.5819	.9999	.0	30′
40′	.4637	45.8	.4638	45.7	.5362	.9998	.1	20′
50′	.5050	41.3	.5053	41.5	.4947	.9998	.0	10′
2° 0′	8.5428	37.8	8.5431	37.8	11.4569	9.9997	.1	**88° 0′**
10′	.5776	34.8	.5779	34.8	.4221	.9997	.0	50′
20′	.6097	32.1	.6101	32.2	.3899	.9996	.1	40′
30′	.6397	30.0	.6401	30.0	.3599	.9996	.0	30′
40′	.6677	28.0	.6682	28.1	.3318	.9995	.1	20′
50′	.6940	26.3	.6945	26.3	.3055	.9995	.0	10′
3° 0′	8.7188	24.8	8.7194	24.9	11.2806	9.9994	.1	**87° 0′**
10′	.7423	23.5	.7429	23.5	.2571	.9993	.1	50′
20′	.7645	22.2	.7652	22.3	.2348	.9993	.0	40′
30′	.7857	21.2	.7865	21.3	.2135	.9992	.1	30′
40′	.8059	20.2	.8067	20.2	.1933	.9991	.1	20′
50′	.8251	19.2	.8261	19.4	.1739	.9990	.1	10
4° 0′	8.8436	18.5	8.8446	18.5	11.1554	9.9989	.1	**86° 0′**
10′	.8613	17.7	.8624	17.8	.1376	.9989	.0	50′
20′	.8783	17.0	.8795	17.1	.1205	.9988	.1	40′
30′	.8946	16.3	.8960	16.5	.1040	.9987	.1	30′
40′	.9104	15.8	.9118	15.8	.0882	.9986	.1	20′
50′	.9256	15.2	.9272	15.4	.0728	.9985	.1	10′
5° 0′	8.9403	14.7	8.9420	14.8	11.0580	9.9983	.2	**85° 0′**
	L Cos	d 1′	L Cot	c d 1′	L Tan	L Sin	d 1′	Angle

Angle	L Sin	d 1′	L Tan	c d 1′	L Cot	L Cos	d 1′	
5° 0′	8.9403		8.9420		11.0580	9.9983		**85° 0′**
10′	.9545	14.2	.9563	14.3	.0437	.9982	.1	50′
20′	.9682	13.7	.9701	13.8	.0299	.9981	.1	40′
30′	.9816	13.4	.9836	13.5	.0164	.9980	.1	30′
40′	.9945	12.9	.9966	13.0	.0034	.9979	.1	20′
50′	9.0070	12.5	9.0093	12.7	10.9907	.9977	.2	10′
6° 0′	9.0192	12.2	9.0216	12.3	10.9784	9.9976	.1	**84° 0′**
10′	.0311	11.9	.0336	12.0	.9664	.9975	.1	50′
20′	.0426	11.5	.0453	11.7	.9547	.9973	.2	40′
30′	.0539	11.3	.0567	11.4	.9433	.9972	.1	30′
40′	.0648	10.9	.0678	11.1	.9322	.9971	.1	20′
50′	.0755	10.7	.0786	10.8	.9214	.9969	.2	10′
7° 0′	9.0859	10.4	9.0891	10.5	10.9109	9.9968	.1	**83° 0′**
10′	.0961	10.2	.0995	10.4	.9005	.9966	.2	50′
20′	.1060	9.9	.1096	10.1	.8904	.9964	.2	40′
30′	.1157	9.7	.1194	9.8	.8806	.9963	.1	30′
40′	.1252	9.5	.1291	9.7	.8709	.9961	.2	20′
50′	.1345	9.3	.1385	9.4	.8615	.9959	.2	10′
8° 0′	9.1436	9.1	9.1478	9.3	10.8522	9.9958	.1	**82° 0′**
10′	.1525	8.9	.1569	9.1	.8431	.9956	.2	50′
20′	.1612	8.7	.1658	8.9	.8342	.9954	.2	40′
30′	.1697	8.5	.1745	8.7	.8255	.9952	.2	30′
40′	.1781	8.4	.1831	8.6	.8169	.9950	.2	20′
50′	.1863	8.2	.1915	8.4	.8085	.9948	.2	10′
9° 0′	9.1943	8.0	9.1997	8.2	10.8003	9.9946	.2	**81° 0′**
10′	.2022	7.9	.2078	8.1	.7922	.9944	.2	50′
20′	.2100	7.8	.2158	8.0	.7842	.9942	.2	40′
30′	.2176	7.6	.2236	7.8	.7764	.9940	.2	30′
40′	.2251	7.5	.2313	7.7	.7687	.9938	.2	20′
50′	.2324	7.3	.2389	7.6	.7611	.9936	.2	10′
10° 0′	9.2397	7.3	9.2463	7.4	10.7537	9.9934	.2	**80° 0′**
10′	.2468	7.1	.2536	7.3	.7464	.9931	.3	50′
20′	.2538	7.0	.2609	7.3	.7391	.9929	.2	40′
30′	.2606	6.8	.2680	7.1	.7320	.9927	.2	30′
40′	.2674	6.8	.2750	7.0	.7250	.9924	.3	20′
50′	.2740	6.6	.2819	6.9	.7181	.9922	.2	10′
11° 0′	9.2806	6.6	9.2887	6.8	10.7113	9.9919	.3	**79° 0′**
10′	.2870	6.4	.2953	6.6	.7047	.9917	.2	50′
20′	.2934	6.4	.3020	6.7	.6980	.9914	.3	40′
30′	.2997	6.3	.3085	6.5	.6915	.9912	.2	30′
40′	.3058	6.1	.3149	6.4	.6851	.9909	.3	20′
50′	.3119	6.1	.3212	6.3	.6788	.9907	.2	10′
12° 0′	9.3179	6.0	9.3275	6.3	10.6725	9.9904	.3	**78° 0′**
10′	.3238	5.9	.3336	6.1	.6664	.9901	.3	50′
20′	.3296	5.8	.3397	6.1	.6603	.9899	.2	40′
30′	.3353	5.7	.3458	6.1	.6542	.9896	.3	30′
40′	.3410	5.7	.3517	5.9	.6483	.9893	.3	20′
50′	.3466	5.6	.3576	5.9	.6424	.9890	.3	10′
13° 0′	9.3521	5.5	9.3634	5.8	10.6366	9.9887	.3	**77° 0′**
	L Cos	d 1′	L Cot	c d 1′	L Tan	L Sin	d 1′	Angle

Angle	L Sin	d 1′	L Tan	c d 1′	L Cot	L Cos	d 1′	
13° 0′	9.3521		9.3634		10.6366	9.9887		**77° 0′**
10′	.3575	5.4	.3691	5.7	.6309	.9884	.3	50′
20′	.3629	5.4	.3748	5.7	.6252	.9881	.3	40′
30′	.3682	5.3	.3804	5.6	.6196	.9878	.3	30′
40′	.3734	5.2	.3859	5.5	.6141	.9875	.3	20′
50′	.3786	5.2	.3914	5.5	.6086	.9872	.3	10′
14° 0′	9.3837	5.1	9.3968	5.4	10.6032	9.9869	.3	**76° 0′**
10′	.3887	5.0	.4021	5.3	.5979	.9866	.3	50′
20′	.3937	5.0	.4074	5.3	.5926	.9863	.3	40′
30′	.3986	4.9	.4127	5.3	.5873	.9859	.4	30′
40′	.4035	4.9	.4178	5.1	.5822	.9856	.3	20′
50′	.4083	4.8	.4230	5.2	.5770	.9853	.3	10′
15° 0′	9.4130	4.7	9.4281	5.1	10.5719	9.9849	.4	**75° 0′**
10′	.4177	4.7	.4331	5.0	.5669	.9846	.3	50′
20′	.4223	4.6	.4381	5.0	.5619	.9843	.3	40′
30′	.4269	4.6	.4430	4.9	.5570	.9839	.4	30′
40′	.4314	4.5	.4479	4.9	.5521	.9836	.3	20′
50′	.4359	4.5	.4527	4.8	.5473	.9832	.4	10′
16° 0′	9.4403	4.4	9.4575	4.8	10.5425	9.9828	.4	**74° 0′**
10′	.4447	4.4	.4622	4.7	.5378	.9825	.3	50′
20′	.4491	4.4	.4669	4.7	.5331	.9821	.4	40′
30′	.4533	4.2	.4716	4.7	.5284	.9817	.4	30′
40	.4576	4.3	.4762	4.6	.5238	.9814	.3	20′
50′	.4618	4.2	.4808	4.6	.5192	.9810	.4	10′
17° 0′	9.4659	4.1	9.4853	4.5	10.5147	9.9806	.4	**73° 0′**
10′	.4700	4.1	.4898	4.5	.5102	.9802	.4	50′
20′	.4741	4.1	.4943	4.5	.5057	.9798	.4	40′
30′	.4781	4.0	.4987	4.4	.5013	.9794	.4	30′
40′	.4821	4.0	.5031	4.4	.4969	.9790	.4	20′
50′	.4861	4.0	.5075	4.4	.4925	.9786	.4	10′
18° 0′	9.4900	3.9	9.5118	4.3	10.4882	9.9782	.4	**72° 0′**
10′	.4939	3.9	.5161	4.3	.4839	.9778	.4	50′
20′	.4977	3.8	.5203	4.2	.4797	.9774	.4	40′
30′	.5015	3.8	.5245	4.2	.4755	.9770	.4	30′
40′	.5052	3.7	.5287	4.2	.4713	.9765	.5	20′
50′	.5090	3.8	.5329	4.2	.4671	.9761	.4	10′
19° 0′	9.5126	3.6	9.5370	4.1	10.4630	9.9757	.4	**71° 0′**
10′	.5163	3.7	.5411	4.1	.4589	.9752	.5	50′
20′	.5199	3.6	.5451	4.0	.4549	.9748	.4	40′
30′	.5235	3.6	.5491	4.0	.4509	.9743	.5	30′
40′	.5270	3.5	.5531	4.0	.4469	.9739	.4	20′
50′	.5306	3.6	.5571	4.0	.4429	.9734	.5	10′
20° 0′	9.5341	3.5	9.5611	4.0	10.4389	9.9730	.4	**70° 0′**
10′	.5375	3.4	.5650	3.9	.4350	.9725	.5	50′
20′	.5409	3.4	.5689	3.9	.4311	.9721	.4	40′
30′	.5443	3.4	.5727	3.8	.4273	.9716	.5	30′
40′	.5477	3.4	.5766	3.9	.4234	.9711	.5	20′
50′	.5510	3.3	.5804	3.8	.4196	.9706	.5	10′
21° 0′	9.5543	3.3	9.5842	3.8	10.4158	9.9702	.4	**69° 0′**
	L Cos	d 1′	L Cot	c d 1′	L Tan	L Sin	d 1′	Angle

Angle	L Sin	d 1′	L Tan	c d 1′	L Cot	L Cos	d 1′	
21° 0′	9.5543		9.5842		10.4158	9.9702		**69° 0′**
		3.3		3.7			.5	
10′	.5576		.5879		.4121	.9697		50′
20′	.5609	3.3	.5917	3.8	.4083	.9692	.5	40′
30′	.5641	3.2	.5954	3.7	.4046	.9687	.5	30′
40′	.5673	3.2	.5991	3.7	.4009	.9682	.5	20′
50′	.5704	3.1	.6028	3.7	.3972	.9677	.5	10′
		3.2		3.6			.5	
22° 0′	9.5736		9.6064		10.3936	9.9672		**68° 0′**
		3.1		3.6			.5	
10′	.5767		.6100		.3900	.9667		50′
20′	.5798	3.1	.6136	3.6	.3864	.9661	.6	40′
30′	.5828	3.0	.6172	3.6	.3828	.9656	.5	30′
40′	.5859	3.1	.6208	3.6	.3792	.9651	.5	20′
50′	.5889	3.0	.6243	3.5	.3757	.9646	.5	10′
		3.0		3.6			.6	
23° 0′	9.5919		9.6279		10.3721	9.9640		**67° 0′**
		2.9		3.5			.5	
10′	.5948		.6314		.3686	.9635		50′
20′	.5978	3.0	.6348	3.4	.3652	.9629	.6	40′
30′	.6007	2.9	.6383	3.5	.3617	.9624	.5	30′
40′	.6036	2.9	.6417	3.4	.3583	.9618	.6	20′
50′	.6065	2.9	.6452	3.5	.3548	.9613	.5	10′
		2.8		3.4			.6	
24° 0′	9.6093		9.6486		10.3514	9.9607		**66° 0′**
		2.8		3.4			.5	
10′	.6121		.6520		.3480	.9602		50′
20′	.6149	2.8	.6553	3.3	.3447	.9596	.6	40′
30′	.6177	2.8	.6587	3.4	.3413	.9590	.6	30′
40′	.6205	2.8	.6620	3.3	.3380	.9584	.6	20′
50′	.6232	2.7	.6654	3.4	.3346	.9579	.5	10′
		2.7		3.3			.6	
25° 0′	9.6259		9.6687		10.3313	9.9573		**65° 0′**
		2.7		3.3			.6	
10′	.6286		.6720		.3280	.9567		50′
20′	.6313	2.7	.6752	3.2	.3248	.9561	.6	40′
30′	.6340	2.7	.6785	3.3	.3215	.9555	.6	30′
40′	.6366	2.6	.6817	3.2	.3183	.9549	.6	20′
50′	.6392	2.6	.6850	3.3	.3150	.9543	.6	10′
		2.6		3.2			.6	
26° 0′	9.6418		9.6882		10.3118	9.9537		**64° 0′**
		2.6		3.2			.7	
10′	.6444		.6914		.3086	.9530		50′
20′	.6470	2.6	.6946	3.2	.3054	.9524	.6	40′
30′	.6495	2.5	.6977	3.1	.3023	.9518	.6	30′
40′	.6521	2.6	.7009	3.2	.2991	.9512	.6	20′
50′	.6546	2.5	.7040	3.1	.2960	.9505	.7	10′
		2.4		3.2			.6	
27° 0′	9.6570		9.7072		10.2928	9.9499		**63° 0′**
		2.5		3.1			.7	
10′	.6595		.7103		.2897	.9492		50′
20′	.6620	2.5	.7134	3.1	.2866	.9486	.6	40′
30′	.6644	2.4	.7165	3.1	.2835	.9479	.7	30′
40′	.6668	2.4	.7196	3.1	.2804	.9473	.6	20′
50′	.6692	2.4	.7226	3.0	.2774	.9466	.7	10′
		2.4		3.1			.7	
28° 0′	9.6716		9.7257		10.2743	9.9459		**62° 0′**
		2.4		3.0			.6	
10′	.6740		.7287		.2713	.9453		50′
20′	.6763	2.3	.7317	3.0	.2683	.9446	.7	40′
30′	.6787	2.4	.7348	3.1	.2652	.9439	.7	30′
40′	.6810	2.3	.7378	3.0	.2622	.9432	.7	20′
50′	.6833	2.3	.7408	3.0	.2592	.9425	.7	10′
		2.3		3.0			.7	
29° 0′	9.6856		9.7438		10.2562	9.9418		**61° 0′**
	L Cos	d 1′	L Cot	c d 1′	L Tan	L Sin	d 1′	Angle

Angle	L Sin	d 1′	L Tan	c d 1′	L Cot	L Cos	d 1′	
29° 0′	9.6856		9.7438		10.2562	9.9418		**61° 0′**
		2.2		2.9			.7	
10′	.6878		.7467		.2533	.9411		50′
20′	.6901	2.3	.7497	3.0	.2503	.9404	.7	40′
30′	.6923	2.2	.7526	2.9	.2474	.9397	.7	30′
40′	.6946	2.3	.7556	3.0	.2444	.9390	.7	20′
50′	.6968	2.2	.7585	2.9	.2415	.9383	.7	10′
		2.2		2.9			.8	
30° 0′	9.6990		9.7614		10.2386	9.9375		**60° 0′**
		2.2		3.0			.7	
10′	.7012		.7644		.2356	.9368		50′
20′	.7033	2.1	.7673	2.9	.2327	.9361	.7	40′
30′	.7055	2.2	.7701	2.8	.2299	.9353	.8	30′
40′	.7076	2.1	.7730	2.9	.2270	.9346	.7	20′
50′	.7097	2.1	.7759	2.9	.2241	.9338	.8	10′
		2.1		2.9			.7	
31° 0′	9.7118		9.7788		10.2212	9.9331		**59° 0′**
		2.1		2.8			.8	
10′	.7139		.7816		.2184	.9323		50′
20′	.7160	2.1	.7845	2.9	.2155	.9315	.8	40′
30′	.7181	2.1	.7873	2.8	.2127	.9308	.7	30′
40′	.7201	2.0	.7902	2.9	.2098	.9300	.8	20′
50′	.7222	2.1	.7930	2.8	.2070	.9292	.8	10′
		2.0		2.8			.8	
32° 0′	9.7242		9.7958		10.2042	9.9284		**58° 0′**
		2.0		2.8			.8	
10′	.7262		.7986		.2014	.9276		50′
20′	.7282	2.0	.8014	2.8	.1986	.9268	.8	40′
30′	.7302	2.0	.8042	2.8	.1958	.9260	.8	30′
40′	.7322	2.0	.8070	2.8	.1930	.9252	.8	20′
50′	.7342	2.0	.8097	2.7	.1903	.9244	.8	10′
		1.9		2.8			.8	
33° 0′	9.7361		9.8125		10.1875	9.9236		**57° 0′**
		1.9		2.8			.8	
10′	.7380		.8153		.1847	.9228		50′
20′	.7400	2.0	.8180	2.7	.1820	.9219	.9	40′
30′	.7419	1.9	.8208	2.8	.1792	.9211	.8	30′
40′	.7438	1.9	.8235	2.7	.1765	.9203	.8	20′
50′	.7457	1.9	.8263	2.8	.1737	.9194	.9	10′
		1.9		2.7			.8	
34° 0′	9.7476		9.8290		10.1710	9.9186		**56° 0′**
		1.8		2.7			.9	
10′	.7494		.8317		.1683	.9177		50′
20′	.7513	1.9	.8344	2.7	.1656	.9169	.8	40′
30′	.7531	1.8	.8371	2.7	.1629	.9160	.9	30′
40′	.7550	1.9	.8398	2.7	.1602	.9151	.9	20′
50′	.7568	1.8	.8425	2.7	.1575	.9142	.9	10′
		1.8		2.7			.8	
35° 0′	9.7586		9.8452		10.1548	9.9134		**55° 0′**
		1.8		2.7			.9	
10′	.7604		.8479		.1521	.9125		50′
20′	.7622	1.8	.8506	2.7	.1494	.9116	.9	40′
30′	.7640	1.8	.8533	2.7	.1467	.9107	.9	30′
40′	.7657	1.7	.8559	2.6	.1441	.9098	.9	20′
50′	.7675	1.8	.8586	2.7	.1414	.9089	.9	10′
		1.7		2.7			.9	
36° 0′	9.7692		9.8613		10.1387	9.9080		**54° 0′**
		1.8		2.6			1.0	
10′	.7710		.8639		.1361	.9070		50′
20′	.7727	1.7	.8666	2.7	.1334	.9061	.9	40′
30′	.7744	1.7	.8692	2.6	.1308	.9052	.9	30′
40′	.7761	1.7	.8718	2.6	.1282	.9042	1.0	20′
50′	.7778	1.7	.8745	2.7	.1255	.9033	.9	10′
		1.7		2.6			1.0	
37° 0′	9.7795		9.8771		10.1229	9.9023		**53° 0′**
	L Cos	d 1′	L Cot	c d 1′	L Tan	L Sin	d 1′	Angle

Angle	L Sin	d 1′	L Tan	c d 1′	L Cot	L Cos	d 1′	
37° 0′	9.7795		9.8771		10.1229	9.9023		**53° 0′**
		1.6		2.6			.9	
10′	.7811		.8797		.1203	.9014		50′
20′	.7828	1.7	.8824	2.7	.1176	.9004	1.0	40′
30′	.7844	1.6	.8850	2.6	.1150	.8995	.9	30′
40′	.7861	1.7	.8876	2.6	.1124	.8985	1.0	20′
50′	.7877	1.6	.8902	2.6	.1098	.8975	1.0	10′
38° 0′	9.7893	1.6	9.8928	2.6	10.1072	9.8965	1.0	**52° 0′**
		1.7		2.6			1.0	
10′	.7910		.8954		.1046	.8955		50′
20′	.7926	1.6	.8980	2.6	.1020	.8945	1.0	40′
30′	.7941	1.5	.9006	2.6	.0994	.8935	1.0	30′
40′	.7957	1.6	.9032	2.6	.0968	.8925	1.0	20′
50′	.7973	1.6	.9058	2.6	.0942	.8915	1.0	10′
39° 0′	9.7989	1.6	9.9084	2.6	10.0916	9.8905	1.0	**51° 0′**
		1.5		2.6			1.0	
10′	.8004		.9110		.0890	.8895		50′
20′	.8020	1.6	.9135	2.5	.0865	.8884	1.1	40′
30′	.8035	1.5	.9161	2.6	.0839	.8874	1.0	30′
40′	.8050	1.5	.9187	2.6	.0813	.8864	1.0	20′
50′	.8066	1.6	.9212	2.5	.0788	.8853	1.1	10′
40° 0′	9.8081	1.5	9.9238	2.6	10.0762	9.8843	1.0	**50° 0′**
		1.5		2.6			1.1	
10′	.8096		.9264		.0736	.8832		50′
20′	.8111	1.5	.9289	2.5	.0711	.8821	1.1	40′
30′	.8125	1.4	.9315	2.6	.0685	.8810	1.1	30′
40′	.8140	1.5	.9341	2.6	.0659	.8800	1.0	20′
50′	.8155	1.5	.9366	2.5	.0634	.8789	1.1	10′
41° 0′	9.8169	1.4	9.9392	2.6	10.0608	9.8778	1.1	**49° 0′**
		1.5		2.5			1.1	
10′	.8184		.9417		.0583	.8767		50′
20′	.8198	1.4	.9443	2.6	.0557	.8756	1.1	40′
30′	.8213	1.5	.9468	2.5	.0532	.8745	1.1	30′
40′	.8227	1.4	.9494	2.6	.0506	.8733	1.2	20′
50′	.8241	1.4	.9519	2.5	.0481	.8722	1.1	10′
42° 0′	9:8255	1.4	9.9544	2.5	10.0456	9.8711	1.1	**48° 0′**
		1.4		2.6			1.2	
10′	.8269		.9570		.0430	.8699		50′
20′	.8283	1.4	.9595	2.5	.0405	.8688	1.1	40′
30′	.8297	1.4	.9621	2.6	.0379	.8676	1.2	30′
40′	.8311	1.4	.9646	2.5	.0354	.8665	1.1	20′
50′	.8324	1.3	.9671	2.5	.0329	.8653	1.2	10′
43° 0′	9.8338	1.4	9.9697	2.6	10.0303	9.8641	1.2	**47° 0′**
		1.3		2.5			1.2	
10′	.8351		.9722		.0278	.8629		50′
20′	.8365	1.4	.9747	2.5	.0253	.8618	1.1	40′
30′	.8378	1.3	.9772	2.5	.0228	.8606	1.2	30′
40′	.8391	1.3	.9798	2.6	.0202	.8594	1.2	20′
50′	.8405	1.4	.9823	2.5	.0177	.8582	1.2	10′
44° 0′	9.8418	1.3	9.9848	2.5	10.0152	9.8569	1.3	**46° 0′**
		1.3		2.6			1.2	
10′	.8431		.9874		.0126	.8557		50′
20′	.8444	1.3	.9899	2.5	.0101	.8545	1.2	40′
30′	.8457	1.3	.9924	2.5	.0076	.8532	1.3	30′
40′	.8469	1.2	.9949	2.5	.0051	.8520	1.2	20′
50′	.8482	1.3	.9975	2.6	.0025	.8507	1.3	10′
45° 0′	9.8495	1.3	10.0000	2.5	10.0000	9.8495	1.2	**45° 0′**
	L Cos	d 1′	L Cot	c d 1′	L Tan	L Sin	d 1′	Angle

FIVE-PLACE TABLES

TABLE V

FIVE-PLACE LOGARITHMS OF THE TRIGONOMETRIC FUNCTIONS OF ANGLES BETWEEN 0° AND 3° AND BETWEEN 87° AND 90°

NOTE. — For angles between 0° and 3° and between 87° and 90° Table V*a* or Table V*b* may be used to avoid interpolation in Table IV or in ordinary five-place tables; the results thus obtained are more accurate. Errors of interpolation in Table V*b* correspond to differences of angle of less than 1″; Table V*a* gives still more accurate results.

V*a*. AUXILIARY TABLE OF S AND T FOR A IN MINUTES

For angles near 0°: $\log \sin A = S + \log A'$ and $\log \tan A = T + \log A'$.

For angles near 90°: $\log \cos A = S_1 + \log A'_1$ and $\log \cot A = T_1 + \log A'_1$ where A'_1 is the number of minutes in $90° - A$ and S_1 and T_1 are corresponding values of S and T.

A'	$S + 10$
0′ – 13′	6.46 373
14′ – 42′	372
43′ – 58′	371
59′ – 71′	6.46 370
72′ – 81′	369
82′ – 91′	368
92′ – 99′	6.46 367
100′ – 107′	366
108′ – 115′	365
116′ – 121′	6.46 364
122′ – 128′	363
129′ – 134′	362
135′ – 140′	6.46 361
141′ – 146′	360
147′ – 151′	359
152′ – 157′	6.46 358
158′ – 162′	357
163′ – 167′	356
168′ – 171′	6.46 355
172′ – 176′	354
177′ – 181′	353

A'	$T + 10$	A'	$T + 10$
0′ – 26′	6.46 373	131′ – 133′	6.46 394
27′ – 39′	374	134′ – 136′	395
40′ – 48′	375	137′ – 139′	396
49′ – 56′	6.46 376	140′ – 142′	6.46 397
57′ – 63′	377	143′ – 145′	398
64′ – 69′	378	146′ – 148′	399
70′ – 74′	6.46 379	149′ – 150′	6.46 400
75′ – 80′	380	151′ – 153′	401
81′ – 85′	381	154′ – 156′	402
86′ – 89′	6.46 382	157′ – 158′	6.46 403
90′ – 94′	383	159′ – 161′	404
95′ – 98′	384	162′ – 163′	405
99′ – 102′	6.46 385	164′ – 166′	6.46 406
103′ – 106′	386	167′ – 168′	407
107′ – 110′	387	169′ – 171′	408
111′ – 113′	6.46 388	172′ – 173′	6.46 409
114′ – 117′	389	174′ – 175′	410
118′ – 120′	390	176′ – 178′	411
121′ – 124′	6.46 391	179′ – 180′	6.46 412
125′ – 127′	392	181′ – 182′	413
128′ – 130′	393	183′ – 184′	414

ANGLES NEAR 0° AND 90°

Angle A	Log Sin A + 10						C
	0″	10″	20″	30″	40″	50″	.0000
0° 0′		5.68 557	5.98 660	6.16 270	6.28 763	6.38 454	0
1′	6.46 373	6.53 067	6.58 866	6.63 982	6.68 557	6.72 697	0
2′	6.76 476	6.79 952	6.83 170	6.86 167	6.88 969	6.91 602	0
3′	6.94 085	6.96 433	6.98 660	7.00 779	7.02 800	7.04 730	0
4′	7.06 579	7.08 351	7.10 055	7.11 694	7.13 273	7.14 797	0
5′	7.16 270	7.17 694	7.19 072	7.20 409	7.21 705	7.22 964	0
6′	7.24 188	7.25 378	7.26 536	7.27 664	7.28 763	7.29 836	0
7′	7.30 882	7.31 904	7.32 903	7.33 879	7.34 833	7.35 767	0
8′	7.36 682	7.37 577	7.38 454	7.39 314	7.40 158	7.40 985	0
9′	7.41 797	7.42 594	7.43 376	7.44 145	7.44 900	7.45 643	0
0° 10′	7.46 373	7.47 090	7.47 797	7.48 491	7.49 175	7.49 849	0
11′	7.50 512	7.51 165	7.51 808	7.52 442	7.53 067	7.53 683	0
12′	7.54 291	7.54 890	7.55 481	7.56 064	7.56 639	7.57 206	0
13′	7.57 767	7.58 320	7.58 866	7.59 406	7.59 939	7.60 465	0
14′	7.60 985	7.61 499	7.62 007	7.62 509	7.63 006	7.63 496	1
15′	7.63 982	7.64 461	7.64 936	7.65 406	7.65 870	7.66 330	1
16′	7.66 784	7.67 235	7.67 680	7.68 121	7.68 557	7.68 989	1
17′	7.69 417	7.69 841	7.70 261	7.70 676	7.71 088	7.71 496	1
18′	7.71 900	7.72 300	7.72 697	7.73 090	7.73 479	7.73 865	1
19′	7.74 248	7.74 627	7.75 003	7.75 376	7.75 745	7.76 112	1
0° 20′	7.76 475	7.76 836	7.77 193	7.77 548	7.77 899	7.78 248	1
21′	7.78 594	7.78 938	7.79 278	7.79 616	7.79 952	7.80 284	1
22′	7.80 615	7.80 942	7.81 268	7.81 591	7.81 911	7.82 229	1
23′	7.82 545	7.82 859	7.83 170	7.83 479	7.83 786	7.84 091	1
24′	7.84 393	7.84 694	7.84 992	7.85 289	7.85 583	7.85 876	1
25′	7.86 166	7.86 455	7.86 741	7.87 026	7.87 309	7.87 590	1
26′	7.87 870	7.88 147	7.88 423	7.88 697	7.88 969	7.89 240	1
27′	7.89 509	7.89 776	7.90 041	7.90 305	7.90 568	7.90 829	1
28′	7.91 088	7.91 346	7.91 602	7.91 857	7.92 110	7.92 362	1
29′	7.92 612	7.92 861	7.93 108	7.93 354	7.93 599	7.93 842	2
0° 30′	7.94 084	7.94 325	7.94 564	7.94 802	7.95 039	7.95 274	2
31′	7.95 508	7.95 741	7.95 973	7.96 203	7.96 432	7.96 660	2
32′	7.96 887	7.97 113	7.97 337	7.97 560	7.97 782	7.98 003	2
33′	7.98 223	7.98 442	7.98 660	7.98 876	7.99 092	7.99 306	2
34′	7.99 520	7.99 732	7.99 943	8.00 154	8.00 363	8.00 571	2
35′	8.00 779	8.00 985	8.01 190	8.01 395	8.01 598	8.01 801	2
36′	8.02 002	8.02 203	8.02 402	8.02 601	8.02 799	8.02 996	2
37′	8.03 192	8.03 387	8.03 581	8.03 775	8.03 967	8.04 159	3
38′	8.04 350	8.04 540	8.04 729	8.04 918	8.05 105	8.05 292	3
39′	8.05 478	8.05 663	8.05 848	8.06 031	8.06 214	8.06 396	3
0° 40′	8.06 578	8.06 758	8.06 938	8.07 117	8.07 295	8.07 473	3
41′	8.07 650	8.07 826	8.08 002	8.08 176	8.08 350	8.08 524	3
42′	8.08 696	8.08 868	8.09 040	8.09 210	8.09 380	8.09 550	4
43′	8.09 718	8.09 886	8.10 054	8.10 220	8.10 386	8.10 552	4
44′	8.10 717	8.10 881	8.11 044	8.11 207	8.11 370	8.11 531	4
45′	8.11 693	8.11 853	8.12 013	8.12 172	8.12 331	8.12 489	4
46′	8.12 647	8.12 804	8.12 961	8.13 117	8.13 272	8.13 427	4
47′	8.13 581	8.13 735	8.13 888	8.14 041	8.14 193	8.14 344	4
48′	8.14 495	8.14 646	8.14 796	8.14 945	8.15 094	8.15 243	4
49′	8.15 391	8.15 538	8.15 685	8.15 832	8.15 978	8.16 123	4
0° 50′	8.16 268	8.16 413	8.16 557	8.16 700	8.16 843	8.16 986	5
51′	8.17 128	8.17 270	8.17 411	8.17 552	8.17 692	8.17 832	5
52′	8.17 971	8.18 110	8.18 249	8.18 387	8.18 524	8.18 662	5
53′	8.18 798	8.18 935	8.19 071	8.19 206	8.19 341	8.19 476	5
54′	8.19 610	8.19 744	8.19 877	8.20 010	8.20 143	8.20 275	6
55′	8.20 407	8.20 538	8.20 669	8.20 800	8.20 930	8.21 060	6
56′	8.21 189	8.21 319	8.21 447	8.21 576	8.21 703	8.21 831	6
57′	8.21 958	8.22 085	8.22 211	8.22 337	8.22 463	8.22 588	6
58′	8.22 713	8.22 838	8.22 962	8.23 086	8.23 210	8.23 333	6
59′	8.23 456	8.23 578	8.23 700	8.23 822	8.23 944	8.24 065	6

See Note, p. 21. Log tan A = Log sin $A + C$; Log cot A = 10 − Log tan A − 10; Log cos A = 10 − C − 10; except for a possible error of 1 in the last place. For functions of angles between 87° and 90° use the relations: Sin B = cos(90° − B); tan B = cot (90° − B); cot B = tan (90° − B); cos B = sin (90° − B).

ANGLES NEAR 0° AND 90°

Angle A	Log Sin A + 10						C	
	0″	10″	20″	30″	40″	50″	.0000	
1° 0′	8.24 186	8.24 306	8.24 426	8.24 546	8.24 665	8.24 785	7	
1′	8.24 903	8.25 022	8.25 140	8.25 258	8.25 375	8.25 493	7	
2′	8.25 609	8.25 726	8.25 842	8.25 958	8.26 074	8.26 189	7	
3′	8.26 304	8.26 419	8.26 533	8.26 648	8.26 761	8.26 875	7	
4′	8.26 988	8.27 101	8.27 214	8.27 326	8.27 438	8.27 550	8	
5′	8.27 661	8.27 773	8.27 883	8.27 994	8.28 104	8.28 215	8	
6′	8.28 324	8.28 434	8.28 543	8.28 652	8.28 761	8.28 869	8	
7′	8.28 977	8.29 085	8.29 193	8.29 300	8.29 407	8.29 514	9	
8′	8.29 621	8.29 727	8.29 833	8.29 939	8.30 044	8.30 150	9	
9′	8.30 255	8.30 359	8.30 464	8.30 568	8.30 672	8.30 776	9	
1° 10′	8.30 879	8.30 983	8.31 086	8.31 188	8.31 291	8.31 393	9	
11′	8.31 495	8.31 597	8.31 699	8.31 800	8.31 901	8.32 002	9	
12′	8.32 103	8.32 203	8.32 303	8.32 403	8.32 503	8.32 602	.00010	
13′	8.32 702	8.32 801	8.32 899	8.32 998	8.33 096	8.33 195	10	
14′	8.33 292	8.33 390	8.33 488	8.33 585	8.33 682	8.33 779	10	
15′	8.33 875	8.33 972	8.34 068	8.34 164	8.34 260	8.34 355	10	
16′	8.34 450	8.34 546	8.34 640	8.34 735	8.34 830	8.34 924	11	
17′	8.35 018	8.35 112	8.35 206	8.35 299	8.35 392	8.35 485	11	
18′	8.35 578	8.35 671	8.35 764	8.35 856	8.35 948	8.36 040	11	
19′	8.36 131	8.36 223	8.36 314	8.36 405	8.36 496	8.36 587	12	
1° 20′	8.36 678	8.36 768	8.36 858	8.36 948	8.37 038	8.37 128	12	
21′	8.37 217	8.37 306	8.37 395	8.37 484	8.37 573	8.37 662	12	
22′	8.37 750	8.37 838	8.37 926	8.38 014	8.38 101	8.38 189	12	
23′	8.38 276	8.38 363	8.38 450	8.38 537	8.38 624	8.38 710	13	
24′	8.38 796	8.38 882	8.38 968	8.39 054	8.39 139	8.39 225	13	
25′	8.39 310	8.39 395	8.39 480	8.39 565	8.39 649	8.39 734	13	
26′	8.39 818	8.39 902	8.39 986	8.40 070	8.40 153	8.40 237	14	
27′	8.40 320	8.40 403	8.40 486	8.40 569	8.40 651	8.40 734	14	
28′	8.40 816	8.40 898	8.40 980	8.41 062	8.41 144	8.41 225	15	
29′	8.41 307	8.41 388	8.41 469	8.41 550	8.41 631	8.41 711	15	
1° 30′	8.41 792	8.41 872	8.41 952	8.42 032	8.42 112	8.42 192	15	
31′	8.42 272	8.42 351	8.42 430	8.42 510	8.42 589	8.42 667	15	
32′	8.42 746	8.42 825	8.42 903	8.42 982	8.43 060	8.43 138	16	
33′	8.43 216	8.43 293	8.43 371	8.43 448	8.43 526	8.43 603	16	
34′	8.43 680	8.43 757	8.43 834	8.43 910	8.43 987	8.44 063	16	
35′	8.44 139	8.44 216	8.44 292	8.44 367	8.44 443	8.44 519	17	
36′	8.44 594	8.44 669	8.44 745	8.44 820	8.44 895	8.44 969	17	
37′	8.45 044	8.45 119	8.45 193	8.45 267	8.45 341	8.45 415	17	
38′	8.45 489	8.45 563	8.45 637	8.45 710	8.45 784	8.45 857	18	
39′	8.45 930	8.46 003	8.46 076	8.46 149	8.46 222	8.46 294	18	
1° 40′	8.46 366	8.46 439	8.46 511	8.46 583	8.46 655	8.46 727	18	
41′	8.46 799	8.46 870	8.46 942	8.47 013	8.47 084	8.47 155	19	
42′	8.47 226	8.47 297	8.47 368	8.47 439	8.47 509	8.47 580	19	
43′	8.47 650	8.47 720	8.47 790	8.47 860	8.47 930	8.48 000	20	
44′	8.48 069	8.48 139	8.48 208	8.48 278	8.48 347	8.48 416	20	
45′	8.48 485	8.48 554	8.48 622	8.48 691	8.48 760	8.48 828	20	
46′	8.48 896	8.48 965	8.49 033	8.49 101	8.49 169	8.49 236	20	
47′	8.49 304	8.49 372	8.49 439	8.49 506	8.49 574	8.49 641	21	
48′	8.49 708	8.49 775	8.49 842	8.49 908	8.49 975	8.50 042	21	
49′	8.50 108	8.50 174	8.50 241	8.50 307	8.50 373	8.50 439	22	
1° 50′	8.50 504	8.50 570	8.50 636	8.50 701	8.50 767	8.50 832	23	
51′	8.50 897	8.50 963	8.51 028	8.51 092	8.51 157	8.51 222	23	
52′	8.51 287	8.51 351	8.51 416	8.51 480	8.51 544	8.51 609	23	
53′	8.51 673	8.51 737	8.51 801	8.51 864	8.51 928	8.51 992	23	
54′	8.52 055	8.52 119	8.52 182	8.52 245	8.52 308	8.52 371	24	
55′	8.52 434	8.52 497	8.52 560	8.52 623	8.52 685	8.52 748	24	
56′	8.52 810	8.52 872	8.52 935	8.52 997	8.53 059	8.53 121	25	
57′	8.53 183	8.53 245	8.53 306	8.53 368	8.53 429	8.53 491	25	
58′	8.53 552	8.53 614	8.53 675	8.53 736	8.53 797	8.53 858	26	
59′	8.53 919	8.53 979	8.54 040	8.54 101	8.54 161	8.54 222	26	

See Note, p. 21. Log tan A = Log sin A + C; Log cot A = 10 − Log tan A − 10; Log cos A = 10 − C − 10; except for a possible error of 1 in the last place. For functions of angles between 87° and 90° use the relations: sin B = cos(90° − B); tan B = cot (90° − B); cot B = tan (90° − B); cos B = sin (90° − B).

ANGLES NEAR 0° AND 90°

Angle A	Log Sin A + 10						C	
	0″	10″	20″	30″	40″	50″	.000	
2° 0′	8.54 282	8.54 342	8.54 402	8.54 462	8.54 522	8.54 582	27	
1′	8.54 642	8.54 702	8.54 762	8.54 821	8.54 881	8.54 940	27	
2′	8.54 999	8.55 059	8.55 118	8.55 177	8.55 236	8.55 295	28	
3′	8.55 354	8.55 413	8.55 471	8.55 530	8.55 589	8.55 647	28	
4′	8.55 705	8.55 764	8.55 822	8.55 880	8.55 938	8.55 996	29	
5′	8.56 054	8.56 112	8.56 170	8.56 227	8.56 285	8.56 342	29	
6′	8.56 400	8.56 457	8.56 515	8.56 572	8.56 629	8.56 686	29	
7′	8.56 743	8.56 800	8.56 857	8.56 914	8.56 970	8.57 027	30	
8′	8.57 084	8.57 140	8.57 196	8.57 253	8.57 309	8.57 365	30	
9′	8.57 421	8.57 477	8.57 533	8.57 589	8.57 645	8.57 701	31	
2° 10′	8.57 757	8.57 812	8.57 868	8.57 927	8.57 979	8.58 034	31	
11′	8.58 089	8.58 144	8.58 200	8.58 255	8.58 310	8.58 364	32	
12′	8.58 419	8.58 474	8.58 529	8.58 583	8.58 638	8.58 693	32	
13′	8.58 747	8.58 801	8.58 856	8.58 910	8.58 964	8.59 018	33	
14′	8.59 072	8.59 126	8.59 180	8.59 234	8.59 288	8.59 341	33	
15′	8.59 395	8.59 448	8.59 502	8.59 555	8.59 609	8.59 662	34	
16′	8.59 715	8.59 768	8.59 821	8.59 874	8.59 927	8.59 980	35	
17′	8.60 033	8.60 086	8.60 139	8.60 191	8.60 244	8.60 296	35	
18′	8.60 349	8.60 401	8.60 454	8.60 506	8.60 558	8.60 610	35	
19′	8.60 662	8.60 714	8.60 766	8.60 818	8.60 870	8.60 922	36	
2° 20′	8.60 973	8.61 025	8.61 077	8.61 128	8.61 180	8.61 231	36	
21′	8.61 282	8.61 334	8.61 385	8.61 436	8.61 487	8.61 538	37	
22′	8.61 589	8.61 640	8.61 691	8.61 742	8.61 792	8.61 843	37	
23′	8.61 894	8.61 944	8.61 995	8.62 045	8.62 096	8.62 146	38	
24′	8.62 196	8.62 246	8.62 297	8.62 347	8.62 397	8.62 447	38	
25′	8.62 497	8.62 546	8.62 596	8.62 646	8.62 696	8.62 745	39	
26′	8.62 795	8.62 844	8.62 894	8.62 943	8.62 993	8.63 042	39	
27′	8.63 091	8.63 140	8.63 189	8.63 238	8.63 288	8.63 336	40	
28′	8.63 385	8.63 434	8.63 483	8.63 532	8.63 580	8.63 629	41	
29′	8.63 678	8.63 726	8.63 775	8.63 823	8.63 871	8.63 920	41	
2° 30′	8.63 968	8.64 016	8.64 064	8.64 112	8.64 160	8.64 208	42	
31′	8.64 256	8.64 304	8.64 352	8.64 400	8.64 448	8.64 495	42	
32′	8.64 543	8.64 590	8.64 638	8.64 685	8.64 733	8.64 780	43	
33′	8.64 827	8.64 875	8.64 922	8.64 969	8.65 016	8.65 063	43	
34′	8.65 110	8.65 157	8.65 204	8.65 251	8.65 298	8.65 344	44	
35′	8.65 391	8.65 438	8.65 484	8.65 531	8.65 577	8.65 624	44	
36′	8.65 670	8.65 717	8.65 763	8.65 809	8.65 855	8.65 901	45	
37′	8.65 947	8.65 994	8.66 040	8.66 085	8.66 131	8.66 177	46	
38′	8.66 223	8.66 269	8.66 314	8.66 360	8.66 406	8.66 451	46	
39′	8.66 497	8.66 542	8.66 588	8.66 633	8.66 678	8.66 724	47	
2° 40′	8.66 769	8.66 814	8.66 859	8.66 904	8.66 949	8.66 994	47	
41′	8.67 039	8.67 084	8.67 129	8.67 174	8.67 219	8.67 263	48	
42′	8.67 308	8.67 353	8.67 397	8.67 442	8.67 486	8.67 531	48	
43′	8.67 575	8.67 619	8.67 664	8.67 708	8.67 752	8.67 796	49	
44′	8.67 841	8.67 885	8.67 929	8.67 973	8.68 017	8.68 060	49	
45′	8.68 104	8.68 148	8.68 192	8.68 236	8.68 279	8.68 323	50	
46′	8.68 367	8.68 410	8.68 454	8.68 497	8.68 540	8.68 584	51	
47′	8.68 627	8.68 670	8.68 714	8.68 757	8.68 800	8.68 843	51	
48′	8.68 886	8.68 929	8.68 972	8.69 015	8.69 058	8.69 101	52	
49′	8.69 144	8.69 187	8.69 229	8.69 272	8.69 315	8.69 357	53	
2° 50′	8.69 400	8.69 442	8.69 485	8.69 527	8.69 570	8.69 612	53	
51′	8.69 654	8.69 697	8.69 739	8.69 781	8.69 823	8.69 865	54	
52′	8.69 907	8.69 949	8.69 991	8.70 033	8.70 075	8.70 117	55	
53′	8.70 159	8.70 201	8.70 242	8.70 284	8.70 326	8.70 367	55	
54′	8.70 409	8.70 451	8.70 492	8.70 534	8.70 575	8.70 616	56	
55′	8.70 658	8.70 699	8.70 740	8.70 781	8.70 823	8.70 864	56	
56′	8.70 905	8.70 946	8.70 987	8.71 028	8.71 069	8.71 110	57	
57′	8.71 151	8.71 192	8.71 232	8.71 273	8.71 314	8.71 355	58	
58′	8.71 395	8.71 436	8.71 476	8.71 517	8.71 557	8.71 598	58	
59′	8.71 638	8.71 679	8.71 719	8.71 759	8.71 800	8.71 840	59	

See Note, p. 21. Log tan A = Log sin A + C; Log cot A = 10 − Log tan A − 10; Log cos A = 10 − C − 10; except for a possible error of 1 in the last place. For functions of angles between 87° and 90° use the relations: sin B = cos (90° − B); tan B = cot(90° − B); cot B = tan(90° − B); cos B = sin (90° − B).

0°

′	L Sin	L Tan	L Cot	L Cos		Prop. Pts.
0	—	—	—	10.00 000	**60**	
1	6.46 373	6.46 373	13.53 627	10.00 000	59	
2	6.76 476	6.76 476	13.23 524	10.00 000	58	
3	6.94 085	6.94 085	13.05 915	10.00 000	57	
4	7.06 579	7.06 579	12.93 421	10.00 000	56	
5	7.16 270	7.16 270	12.83 730	10.00 000	55	
6	7.24 188	7.24 188	12.75 812	10.00 000	54	
7	7.30 882	7.30 882	12.69 118	10.00 000	53	
8	7.36 682	7.36 682	12.63 318	10.00 000	52	
9	7.41 797	7.41 797	12.58 203	10.00 000	51	
10	7.46 373	7.46 373	12.53 627	10.00 000	**50**	
11	7.50 512	7.50 512	12.49 488	10.00 000	49	
12	7.54 291	7.54 291	12.45 709	10.00 000	48	
13	7.57 767	7.57 767	12.42 233	10.00 000	47	
14	7.60 985	7.60 986	12.39 014	10.00 000	46	
15	7.63 982	7.63 982	12.36 018	10.00 000	45	
16	7.66 784	7.66 785	12.33 215	10.00 000	44	
17	7.69 417	7.69 418	12.30 582	9.99 999	43	
18	7.71 900	7.71 900	12.28 100	9.99 999	42	
19	7.74 248	7.74 248	12.25 752	9.99 999	41	
20	7.76 475	7.76 476	12.23 524	9.99 999	**40**	
21	7.78 594	7.78 595	12.21 405	9.99 999	39	
22	7.80 615	7.80 615	12.19 385	9.99 999	38	
23	7.82 545	7.82 546	12.17 454	9.99 999	37	
24	7.84 393	7.84 394	12.15 606	9.99 999	36	
25	7.86 166	7.86 167	12.13 833	9.99 999	35	
26	7.87 870	7.87 871	12.12 129	9.99 999	34	
27	7.89 509	7.89 510	12.10 490	9.99 999	33	
28	7.91 088	7.91 089	12.08 911	9.99 999	32	
29	7.92 612	7.92 613	12.07 387	9.99 998	31	
30	7.94 084	7.94 086	12.05 914	9.99 998	**30**	
31	7.95 508	7.95 510	12.04 490	9.99 998	29	
32	7.96 887	7.96 889	12.03 111	9.99 998	28	
33	7.98 223	7.98 225	12.01 775	9.99 998	27	
34	7.99 520	7.99 522	12.00 478	9.99 998	26	
35	8.00 779	8.00 781	11.99 219	9.99 998	25	
36	8.02 002	8.02 004	11.97 996	9.99 998	24	
37	8.03 192	8.03 194	11.96 806	9.99 997	23	
38	8.04 350	8.04 353	11.95 647	9.99 997	22	
39	8.05 478	8.05 481	11.94 519	9.99 997	21	
40	8.06 578	8.06 581	11.93 419	9.99 997	**20**	
41	8.07 650	8.07 653	11.92 347	9.99 997	19	
42	8.08 696	8.08 700	11.91 300	9.99 997	18	
43	8.09 718	8.09 722	11.90 278	9.99 997	17	
44	8.10 717	8.10 720	11.89 280	9.99 996	16	
45	8.11 693	8.11 696	11.88 304	9.99 996	15	
46	8.12 647	8.12 651	11.87 349	9.99 996	14	
47	8.13 581	8.13 585	11.86 415	9.99 996	13	
48	8.14 495	8.14 500	11.85 500	9.99 996	12	
49	8.15 391	8.15 395	11.84 605	9.99 996	11	
50	8.16 268	8.16 273	11.83 727	9.99 995	**10**	
51	8.17 128	8.17 133	11.82 867	9.99 995	9	
52	8.17 971	8.17 976	11.82 024	9.99 995	8	
53	8.18 798	8.18 804	11.81 196	9.99 995	7	
54	8.19 610	8.19 616	11.80 384	9.99 995	6	
55	8.20 407	8.20 413	11.79 587	9.99 994	5	
56	8.21 189	8.21 195	11.78 805	9.99 994	4	
57	8.21 958	8.21 964	11.78 036	9.99 994	3	
58	8.22 713	8.22 720	11.77 280	9.99 994	2	
59	8.23 456	8.23 462	11.76 538	9.99 994	1	
60	8.24 186	8.24 192	11.75 808	9.99 993	**0**	
	L Cos	L Cot	L Tan	L Sin	′	Prop. Pts.

To avoid interpolation use Table V*a* or V*b*. See Note page 21.
Must subtract 10 from tabulated values of logarithms.

89°

1°

′	L Sin	L Tan	L Cot	L Cos.		Prop. Pts.
0	8.24 186	8.24 192	11.75 808	9.99 993	**60**	
1	8.24 903	8.24 910	11.75 090	9.99 993	59	
2	8.25 609	8.25 616	11.74 384	9.99 993	58	
3	8.26 304	8.26 312	11.73 688	9.99 993	57	
4	8.26 988	8.26 996	11.73 004	9.99 992	56	
5	8.27 661	8.27 669	11.72 331	9.99 992	55	
6	8.28 324	8.28 332	11.71 668	9.99 992	54	
7	8.28 977	8.28 986	11.71 014	9.99 992	53	
8	8.29 621	8.29 629	11.70 371	9.99 992	52	
9	8.30 255	8.30 263	11.69 737	9.99 991	51	
10	8.30 879	8.30 888	11.69 112	9.99 991	**50**	
11	8.31 495	8.31 505	11.68 495	9.99 991	49	
12	8.32 103	8.32 112	11.67 888	9.99 990	48	
13	8.32 702	8.32 711	11.67 289	9.99 990	47	
14	8.33 292	8.33 302	11.66 698	9.99 990	46	
15	8.33 875	8.33 886	11.66 114	9.99 990	45	
16	8.34 450	8.34 461	11.65 539	9.99 989	44	
17	8.35 018	8.35 029	11.64 971	9.99 989	43	
18	8.35 578	8.35 590	11.64 410	9.99 989	42	
19	8.36 131	8.36 143	11.63 857	9.99 989	41	
20	8.36 678	8.36 689	11.63 311	9.99 988	**40**	
21	8.37 217	8.37 229	11.62 771	9.99 988	39	
22	8.37 750	8.37 762	11.62 238	9.99 988	38	
23	8.38 276	8.38 289	11.61 711	9.99 987	37	
24	8.38 796	8.38 809	11.61 191	9.99 987	36	
25	8.39 310	8.39 323	11.60 677	9.99 987	35	
26	8.39 818	8.39 832	11.60 168	9.99 986	34	
27	8.40 320	8.40 334	11.59 666	9.99 986	33	
28	8.40 816	8.40 830	11.59 170	9.99 986	32	
29	8.41 307	8.41 321	11.58 679	9.99 985	31	
30	8.41 792	8.41 807	11.58 193	9.99 985	**30**	
31	8.42 272	8.42 287	11.57 713	9.99 985	29	
32	8.42 746	8.42 762	11.57 238	9.99 984	28	
33	8.43 216	8.43 232	11.56 768	9.99 984	27	
34	8.43 680	8.43 696	11.56 304	9.99 984	26	
35	8.44 139	8.44 156	11.55 844	9.99 983	25	
36	8.44 594	8.44 611	11.55 389	9.99 983	24	
37	8.45 044	8.45 061	11.54 939	9.99 983	23	
38	8.45 489	8.45 507	11.54 493	9.99 982	22	
39	8.45 930	8.45 948	11.54 052	9.99 982	21	
40	8.46 366	8.46 385	11.53 615	9.99 982	**20**	
41	8.46 799	8.46 817	11.53 183	9.99 981	19	
42	8.47 226	8.47 245	11.52 755	9.99 981	18	
43	8.47 650	8.47 669	11.52 331	9.99 981	17	
44	8.48 069	8.48 089	11.51 911	9.99 980	16	
45	8.48 485	8.48 505	11.51 495	9.99 980	15	
46	8.48 896	8.48 917	11.51 083	9.99 979	14	
47	8.49 304	8.49 325	11.50 675	9.99 979	13	
48	8.49 708	8.49 729	11.50 271	9.99 979	12	
49	8.50 108	8.50 130	11.49 870	9.99 978	11	
50	8.50 504	8.50 527	11.49 473	9.99 978	**10**	
51	8.50 897	8.50 920	11.49 080	9.99 977	9	
52	8.51 287	8.51 310	11.48 690	9.99 977	8	
53	8.51 673	8.51 696	11.48 304	9.99 977	7	
54	8.52 055	8.52 079	11.47 921	9.99 976	6	
55	8.52 434	8.52 459	11.47 541	9.99 976	5	
56	8.52 810	8.52 835	11.47 165	9.99 975	4	
57	8.53 183	8.53 208	11.46 792	9.99 975	3	
58	8.53 552	8.53 578	11.46 422	9.99 974	2	
59	8.53 919	8.53 945	11.46 055	9.99 974	1	
60	8.54 282	8.54 308	11.45 692	9.99 974	**0**	
	L Cos	L Cot	L Tan	L Sin	′	Prop. Pts.

To avoid interpolation use Table *Va* or *Vb*. See Note page 21.
Must subtract 10 from tabulated values of logarithms.

88°

2°

′	L Sin	L Tan	L Cot	L Cos		Prop. Pts.
0	8.54 282	8.54 308	11.45 692	9.99 974	**60**	
1	8.54 642	8.54 669	11.45 331	9.99 973	59	
2	8.54 999	8.55 027	11.44 973	9.99 973	58	
3	8.55 354	8.55 382	11.44 618	9.99 972	57	
4	8.55 705	8.55 734	11.44 266	9.99 972	56	
5	8.56 054	8.56 083	11.43 917	9.99 971	55	
6	8.56 400	8.56 429	11.43 571	9.99 971	54	
7	8.56 743	8.56 773	11.43 227	9.99 970	53	
8	8.57 084	8.57 114	11.42 886	9.99 970	52	
9	8.57 421	8.57 452	11.42 548	9.99 969	51	
10	8.57 757	8.57 788	11.42 212	9.99 969	**50**	
11	8.58 089	8.58 121	11.41 879	9.99 968	49	
12	8.58 419	8.58 451	11.41 549	9.99 968	48	
13	8.58 747	8.58 779	11.41 221	9.99 967	47	
14	8.59 072	8.59 105	11.40 895	9.99 967	46	
15	8.59 395	8.59 428	11.40 572	9.99 967	45	
16	8.59 715	8.59 749	11.40 251	9.99 966	44	
17	8.60 033	8.60 068	11.39 932	9.99 966	43	
18	8.60 349	8.60 384	11.39 616	9.99 965	42	
19	8.60 662	8.60 698	11.39 302	9.99 964	41	
20	8.60 973	8.61 009	11.38 991	9.99 964	**40**	
21	8.61 282	8.61 319	11.38 681	9.99 963	39	
22	8.61 589	8.61 626	11.38 374	9.99 963	38	
23	8.61 894	8.61 931	11.38 069	9.99 962	37	
24	8.62 196	8.62 234	11.37 766	9.99 962	36	
25	8.62 497	8.62 535	11.37 465	9.99 961	35	
26	8.62 795	8.62 834	11.37 166	9.99 961	34	
27	8.63 091	8.63 131	11.36 869	9.99 960	33	
28	8.63 385	8.63 426	11.36 574	9.99 960	32	
29	8.63 678	8.63 718	11.36 282	9.99 959	31	
30	8.63 968	8.64 009	11.35 991	9.99 959	**30**	
31	8.64 256	8.64 298	11.35 702	9.99 958	29	
32	8.64 543	8.64 585	11.35 415	9.99 958	28	
33	8.64 827	8.64 870	11.35 130	9.99 957	27	
34	8.65 110	8.65 154	11.34 846	9.99 956	26	
35	8.65 391	8.65 435	11.34 565	9.99 956	25	
36	8.65 670	8.65 715	11.34 285	9.99 955	24	
37	8.65 947	8.65 993	11.34 007	9.99 955	23	
38	8.66 223	8.66 269	11.33 731	9.99 954	22	
39	8.66 497	8.66 543	11.33 457	9.99 954	21	
40	8.66 769	8.66 816	11.33 184	9.99 953	**20**	
41	8.67 039	8.67 087	11.32 913	9.99 952	19	
42	8.67 308	8.67 356	11.32 644	9.99 952	18	
43	8.67 575	8.67 624	11.32 376	9.99 951	17	
44	8.67 841	8.67 890	11.32 110	9.99 951	16	
45	8.68 104	8.68 154	11.31 846	9.99 950	15	
46	8.68 367	8.68 417	11.31 583	9.99 949	14	
47	8.68 627	8.68 678	11.31 322	9.99 949	13	
48	8.68 886	8.68 938	11.31 062	9.99 948	12	
49	8.69 144	8.69 196	11.30 804	9.99 948	11	
50	8.69 400	8.69 453	11.30 547	9.99 947	**10**	
51	8.69 654	8.69 708	11.30 292	9.99 946	9	
52	8.69 907	8.69 962	11.30 038	9.99 946	8	
53	8.70 159	8.70 214	11.29 786	9.99 945	7	
54	8.70 409	8.70 465	11.29 535	9.99 944	6	
55	8.70 658	8.70 714	11.29 286	9.99 944	5	
56	8.70 905	8.70 962	11.29 038	9.99 943	4	
57	8.71 151	8.71 208	11.28 792	9.99 942	3	
58	8.71 395	8.71 453	11.28 547	9.99 942	2	
59	8 71 638	8.71 697	11.28 303	9.99 941	1	
60	8.71 880	8.71 940	11.28 060	9.99 940	**0**	
	L Cos	L Cot	L Tan	L Sin	′	Prop. Pts.

To avoid interpolation use Table *Va* or *Vb*. See Note page 21.
Must subtract 10 from tabulated values of logarithms.

87°

3°

′	L Sin	d	L Tan	c d	L Cot	L Cos		Prop. Pts.
0	8.71 880		8.71 940		11.28 060	9.99 940	**60**	
1	8.72 120	240	8.72 181	241	11.27 819	9.99 940	59	
2	8.72 359	239	8.72 420	239	11.27 580	9.99 939	58	
3	8.72.597	238	8.72 659	239	11.27 341	9.99 938	57	
4	8.72 834	237	8.72 896	237	11.27 104	9.99 938	56	
5	8.73 069	235	8.73 132	236	11.26 868	9.99 937	55	
6	8.73 303	234	8.73 366	234	11.26 634	9.99 936	54	
7	8.73 535	232	8.73 600	234	11.26 400	9.99 936	53	
8	8.73 767	232	8.73 832	232	11.26 168	9.99 935	52	
9	8.73 997	230	8.74 063	231	11.25 937	9.99 934	51	
10	8.74 226	229	8.74 292	229	11.25 708	9.99 934	**50**	
11	8.74 454	228	8.74 521	229	11.25 479	9.99 933	49	
12	8.74 680	226	8.74 748	227	11.25 252	9.99 932	48	
13	8.74 906	226	8.74 974	226	11.25 026	9.99 932	47	
14	8.75 130	224	8.75 199	225	11.24 801	9.99 931	46	
15	8.75 353	223	8.75 423	224	11.24 577	9.99 930	45	
16	8.75 575	222	8.75 645	222	11.24 355	9.99 929	44	
17	8.75 795	220	8.75 867	222	11.24 133	9.99 929	43	
18	8.76 015	220	8.76 087	220	11.23 913	9.99 928	42	
19	8.76 234	219	8.76 306	219	11.23 694	9.99 927	41	
20	8.76 451	217	8.76 525	219	11.23 475	9.99 926	**40**	
21	8.76 667	216	8.76 742	217	11.23 258	9.99 926	39	
22	8.76 883	216	8.76 958	216	11.23 042	9.99 925	38	
23	8.77 097	214	8.77 173	215	11.22 827	9.99 924	37	
24	8.77 310	213	8.77 387	214	11.22 613	9.99 923	36	
25	8.77 522	212	8.77 600	213	11.22 400	9.99 923	35	
26	8.77 733	211	8.77 811	211	11.22 189	9.99 922	34	
27	8.77 943	210	8.78 022	211	11.21 978	9.99 921	33	
28	8.78 152	209	8.78 232	210	11.21 768	9.99 920	32	
29	8.78 360	208	8.78 441	209	11.21 559	9.99 920	31	
30	8.78 568	208	8.78 649	208	11.21 351	9.99 919	**30**	
31	8.78 774	206	8.78 855	206	11.21 145	9.99 918	29	
32	8.78 979	205	8.79 061	206	11.20 939	9.99 917	28	
33	8.79 183	204	8.79 266	205	11.20 734	9.99 917	27	
34	8.79 386	203	8.79 470	204	11.20 530	9.99 916	26	
35	8.79 588	202	8.79 673	203	11.20 327	9.99 915	25	
36	8.79 789	201	8.79 875	202	11.20 125	9.99 914	24	
37	8.79 990	201	8.80 076	201	11.19 924	9.99 913	23	
38	8.80 189	199	8.80 277	201	11.19 723	9.99 913	22	
39	8.80 388	199	8.80 476	199	11.19 524	9.99 912	21	
40	8.80 585	197	8.80 674	198	11.19 326	9.99 911	**20**	
41	8.80 782	197	8.80 872	198	11.19 128	9.99 910	19	
42	8.80 978	196	8.81 068	196	11.18 932	9.99 909	18	
43	8.81 173	195	8.81 264	196	11.18 736	9.99 909	17	
44	8.81 367	194	8.81 459	195	11.18 541	9.99 908	16	
45	8.81 560	193	8.81 653	194	11.18 347	9.99 907	15	
46	8.81 752	192	8.81 846	193	11.18 154	9.99 906	14	
47	8.81 944	192	8.82 038	192	11.17 962	9.99 905	13	
48	8.82 134	190	8.82 230	192	11.17 770	9.99 904	12	
49	8.82 324	190	8.82 420	190	11.17 580	9.99 904	11	
50	8.82 513	189	8.82 610	190	11.17 390	9.99 903	**10**	
51	8.82 701	188	8.82 799	189	11.17 201	9.99 902	9	
52	8.82 888	187	8.82 987	188	11.17 013	9.99 901	8	
53	8.83 075	187	8.83 175	188	11.16 825	9.99 900	7	
54	8.83 261	186	8.83 361	186	11.16 639	9.99 899	6	
55	8.83 446	185	8.83 547	186	11.16 453	9.99 898	5	
56	8.83 630	184	8.83 732	185	11.16 268	9.99 898	4	
57	8.83 813	183	8.83 916	184	11.16 084	9.99 897	3	
58	8.83 996	183	8.84 100	184	11.15 900	9.99 896	2	
59	8.84 177	181	8.84 282	182	11.15 718	9.99 895	1	
60	8.84 358	181	8.84 464	182	11.15 536	9.99 894	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	′	Prop. Pts.

See opposite page for Proportional Parts.

86°

Proportional Parts for 3°

"	241	240	239	238	237	236	235	234	232	231	230
6	24.1	24.0	23.9	23.8	23.7	23.6	23.5	23.4	23.2	23.1	23.0
7	28.1	28.0	27.9	27.8	27.6	27.5	27.4	27.3	27.1	27.0	26.8
8	32.1	32.0	31.9	31.7	31.6	31.5	31.3	31.2	30.9	30.8	30.7
9	36.2	36.0	35.8	35.7	35.6	35.4	35.2	35.1	34.8	34.7	34.5
10	40.2	40.0	39.8	39.7	39.5	39.3	39.2	39.0	38.7	38.5	38.3
20	80.3	80.0	79.7	79.3	79.0	78.7	78.3	78.0	77.3	77.0	76.7
30	120.5	120.0	119.5	119.0	118.5	118.0	117.5	117.0	116.0	115.5	115.0
40	160.7	160.0	159.3	158.7	158.0	157.3	156.7	156.0	154.7	154.0	153.3
50	200.8	200.0	199.2	198.3	197.5	196.7	195.8	195.0	193.3	192.5	191.7

"	229	228	227	226	225	224	223	222	220	219	217
6	22.9	22.8	22.7	22.6	22.5	22.4	22.3	22.2	22.0	21.9	21.7
7	26.7	26.6	26.5	26.4	26.2	26.1	26.0	25.9	25.7	25.6	25.3
8	30.5	30.4	30.3	30.1	30.0	29.9	29.7	29.6	29.3	29.2	28.9
9	34.4	34.2	34.0	33.9	33.8	33.6	33.4	33.3	33.0	32.9	32.6
10	38.2	38.0	37.8	37.7	37.5	37.3	37.2	37.0	36.7	36.5	36.2
20	76.3	76.0	75.7	75.3	75.0	74.7	74.3	74.0	73.3	73.0	72.3
30	114.5	114.0	113.5	113.0	112.5	112.0	111.5	111.0	110.0	109.5	108.5
40	152.7	152.0	151.3	150.7	150.0	149.3	148.7	148.0	146.7	146.0	144.7
50	190.8	190.0	189.2	188.3	187.5	186.7	185.8	185.0	183.3	182.5	180.8

"	216	215	214	213	212	211	210	209	208	206	205
6	21.6	21.5	21.4	21.3	21.2	21.1	21.0	20.9	20.8	20.6	20.5
7	25.2	25.1	25.0	24.9	24.7	24.6	24.5	24.4	24.3	24.0	23.9
8	28.8	28.7	28.5	28.4	28.3	28.1	28.0	27.9	27.7	27.5	27.3
9	32.4	32.2	32.1	32.0	31.8	31.6	31.5	31.4	31.2	30.9	30.8
10	36.0	35.8	35.7	35.5	35.3	35.2	35.0	34.8	34.7	34.3	34.2
20	72.0	71.7	71.3	71.0	70.7	70.3	70.0	69.7	69.3	68.7	68.3
30	108.0	107.5	107.0	106.5	106.0	105.5	105.0	104.5	104.0	103.0	102.5
40	144.0	143.3	142.7	142.0	141.3	140.7	140.0	139.3	138.7	137.3	136.7
50	180.0	179.2	178.3	177.5	176.7	175.8	175.0	174.2	173.3	171.7	170.8

"	204	203	202	201	199	198	197	196	195	194	193
6	20.4	20.3	20.2	20.1	19.9	19.8	19.7	19.6	19.5	19.4	19.3
7	23.8	23.7	23.6	23.4	23.2	23.1	23.0	22.9	22.8	22.6	22.5
8	27.2	27.1	26.9	26.8	26.5	26.4	26.3	26.1	26.0	25.9	25.7
9	30.6	30.4	30.3	30.2	29.8	29.7	29.6	29.4	29.2	29.1	29.0
10	34.0	33.8	33.7	33.5	33.2	33.0	32.8	32.7	32.5	32.3	32.2
20	68.0	67.7	67.3	67.0	66.3	66.0	65.7	65.3	65.0	64.7	64.3
30	102.0	101.5	101.0	100.5	99.5	99.0	98.5	98.0	97.5	97.0	96.5
40	136.0	135.3	134.7	134.0	132.7	132.0	131.3	130.7	130.0	129.3	128.7
50	170.0	169.2	168.3	167.5	165.8	165.0	164.2	163.3	162.5	161.7	160.8

"	192	190	189	188	187	186	185	184	183	182	181
6	19.2	19.0	18.9	18.8	18.7	18.6	18.5	18.4	18.3	18.2	18.1
7	22.4	22.2	22.1	21.9	21.8	21.7	21.6	21.5	21.4	21.2	21.1
8	25.6	25.3	25.2	25.1	24.9	24.8	24.7	24.5	24.4	24.3	24.1
9	28.8	28.5	28.4	28.2	28.1	27.9	27.8	27.6	27.4	27.3	27.2
10	32.0	31.7	31.5	31.3	31.2	31.0	30.8	30.7	30.5	30.3	30.2
20	64.0	63.3	63.0	62.7	62.3	62.0	61.7	61.3	61.0	60.7	60.3
30	96.0	95.0	94.5	94.0	93.5	93.0	92.5	92.0	91.5	91.0	90.5
40	128.0	126.7	126.0	125.3	124.7	124.0	123.3	122.7	122.0	121.3	120.7
50	160.0	158.3	157.5	156.7	155.8	155.0	154.2	153.3	152.5	151.7	150.8

4°

′	L Sin	d	L Tan	c d	L Cot	L Cos		Prop. Pts.
0	8.84 358		8.84 464		11.15 536	9.99 894	**60**	
1	8.84 539	181	8.84 646	182	11.15 354	9.99 893	59	
2	8.84 718	179	8.84 826	180	11.15 174	9.99 892	58	
3	8.84 897	179	8.85 006	180	11.14 994	9.99 891	57	
4	8.85 075	178	8.85 185	179	11.14 815	9.99 891	56	
5	8.85 252	177	8.85 363	178	11.14 637	9.99 890	55	
6	8.85 429	177	8.85 540	177	11.14 460	9.99 889	54	
7	8.85 605	176	8.85 717	177	11.14 283	9.99 888	53	
8	8.85 780	175	8.85 893	176	11.14 107	9.99 887	52	
9	8.85 955	175	8.86 069	176	11.13 931	9.99 886	51	
10	8.86 128	173	8.86 243	174	11.13 757	9.99 885	**50**	
11	8.86 301	173	8.86 417	174	11.13 583	9.99 884	49	
12	8.86 474	173	8.86 591	174	11.13 409	9.99 883	48	
13	8.86 645	171	8.86 763	172	11.13 237	9.99 882	47	
14	8.86 816	171	8.86 935	172	11.13 065	9.99 881	46	
15	8.86 987	171	8.87 106	171	11.12 894	9.99 880	45	
16	8.87 156	169	8.87 277	171	11.12 723	9.99 879	44	
17	8.87 325	169	8.87 447	170	11.12 553	9.99 879	43	
18	8.87 494	169	8.87 616	169	11.12 384	9.99 878	42	
19	8.87 661	167	8.87 785	169	11.12 215	9.99 877	41	
20	8.87 829	168	8.87 953	168	11.12 047	9.99 876	**40**	
21	8.87 995	166	8.88 120	167	11.11 880	9.99 875	39	
22	8.88 161	166	8.88 287	167	11.11 713	9.99 874	38	
23	8.88 326	165	8.88 453	166	11.11 547	9.99 873	37	
24	8.88 490	164	8.88 618	165	11.11 382	9.99 872	36	
25	8.88 654	164	8.88 783	165	11.11 217	9.99 871	35	
26	8.88 817	163	8.88 948	165	11.11 052	9.99 870	34	
27	8.88 980	163	8.89 111	163	11.10 889	9.99 869	33	
28	8.89 142	162	8.89 274	163	11.10 726	9.99 868	32	
29	8.89 304	162	8.89 437	163	11.10 563	9.99 867	31	
30	8.89 464	160	8.89 598	161	11.10 402	9.99 866	**30**	
31	8.89 625	161	8.89 760	162	11.10 240	9.99 865	29	
32	8.89 784	159	8.89 920	160	11.10 080	9.99 864	28	
33	8.89 943	159	8.90 080	160	11.09 920	9.99 863	27	
34	8.90 102	159	8.90 240	160	11.09 760	9.99 862	26	
35	8.90 260	158	8.90 399	159	11.09 601	9.99 861	25	
36	8.90 417	157	8.90 557	158	11.09 443	9.99 860	24	
37	8.90 574	157	8.90 715	158	11.09 285	9.99 859	23	
38	8.90 730	156	8.90 872	157	11.09 128	9.99 858	22	
39	8.90 885	155	8.91 029	157	11.08 971	9.99 857	21	
40	8.91 040	155	8.91 185	156	11.08 815	9.99 856	**20**	
41	8.91 195	155	8.91 340	155	11.08 660	9.99 855	19	
42	8.91 349	154	8.91 495	155	11.08 505	9.99 854	18	
43	8.91 502	153	8.91 650	155	11.08 350	9.99 853	17	
44	8.91 655	153	8.91 803	153	11.08 197	9.99 852	16	
45	8.91 807	152	8.91 957	154	11.08 043	9.99 851	15	
46	8.91 959	152	8.92 110	153	11.07 890	9.99 850	14	
47	8.92 110	151	8.92 262	152	11.07 738	9.99 848	13	
48	8.92 261	151	8.92 414	152	11.07 586	9.99 847	12	
49	8.92 411	150	8.92 565	151	11.07 435	9.99 846	11	
50	8.92 561	150	8.92 716	151	11.07 284	9.99 845	**10**	
51	8.92 710	149	8.92 866	150	11.07 134	9.99 844	9	
52	8.92 859	149	8.93 016	150	11.06 984	9.99 843	8	
53	8.93 007	148	8.93 165	149	11.06 835	9.99 842	7	
54	8.93 154	147	8.93 313	148	11.06 687	9.99 841	6	
55	8.93 301	147	8.93 462	149	11.06 538	9.99 840	5	
56	8.93 448	147	8.93 609	147	11.06 391	9.99 839	4	
57	8.93 594	146	8.93 756	147	11.06 244	9.99 838	3	
58	8.93 740	146	8.93 903	147	11.06 097	9.99 837	2	
59	8.93 885	145	8.94 049	146	11.05 951	9.99 836	1	
60	8.94 030	145	8.94 195	146	11.05 805	9.99 834	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	′	Prop. Pts.

See opposite page for Proportional Parts.

85°

Proportional Parts for 4°

"	182	181	180	179	178	177	176
6	18.2	18.1	18.0	17.9	17.8	17.7	17.6
7	21.2	21.1	21.0	20.9	20.8	20.6	20.5
8	24.3	24.1	24.0	23.9	23.7	23.6	23.5
9	27.3	27.2	27.0	26.8	26.7	26.6	26.4
10	30.3	30.2	30.0	29.8	29.7	29.5	29.3
20	60.7	60.3	60.0	59.7	59.3	59.0	58.7
30	91.0	90.5	90.0	89.5	89.0	88.5	88.0
40	121.3	120.7	120.0	119.3	118.7	118.0	117.3
50	151.7	150.8	150.0	149.2	148.3	147.5	146.7

"	175	174	173	172	171	170	169
6	17.5	17.4	17.3	17.2	17.1	17.0	16.9
7	20.4	20.3	20.2	20.1	20.0	19.8	19.7
8	23.3	23.2	23.1	22.9	22.8	22.7	22.5
9	26.2	26.1	26.0	25.8	25.6	25.5	25.4
10	29.2	29.0	28.8	28.7	28.5	28.3	28.2
20	58.3	58.0	57.7	57.3	57.0	56.7	56.3
30	87.5	87.0	86.5	86.0	85.5	85.0	84.5
40	116.7	116.0	115.3	114.7	114.0	113.3	112.7
50	145.8	145.0	144.2	143.3	142.5	141.7	140.8

"	168	167	166	165	164	163	162
6	16.8	16.7	16.6	16.5	16.4	16.3	16.2
7	19.6	19.5	19.4	19.2	19.1	19.0	18.9
8	22.4	22.3	22.1	22.0	21.9	21.7	21.6
9	25.2	25.0	24.9	24.8	24.6	24.4	24.3
10	28.0	27.8	27.7	27.5	27.3	27.2	27.0
20	56.0	55.7	55.3	55.0	54.7	54.3	54.0
30	84.0	83.5	83.0	82.5	82.0	81.5	81.0
40	112.0	111.3	110.7	110.0	109.3	108.7	108.0
50	140.0	139.2	138.3	137.5	136.7	135.8	135.0

"	161	160	159	158	157	156	155
6	16.1	16.0	15.9	15.8	15.7	15.6	15.5
7	18.8	18.7	18.6	18.4	18.3	18.2	18.1
8	21.5	21.3	21.2	21.1	20.9	20.8	20.7
9	24.2	24.0	23.8	23.7	23.6	23.4	23.2
10	26.8	26.7	26.5	26.3	26.2	26.0	25.8
20	53.7	53.3	53.0	52.7	52.3	52.0	51.7
30	80.5	80.0	79.5	79.0	78.5	78.0	77.5
40	107.3	106.7	106.0	105.3	104.7	104.0	103.3
50	134.2	133.3	132.5	131.7	130.8	130.0	129.2

"	154	153	152	151	150	149	148
6	15.4	15.3	15.2	15.1	15.0	14.9	14.8
7	18.0	17.8	17.7	17.6	17.5	17.4	17.3
8	20.5	20.4	20.3	20.1	20.0	19.9	19.7
9	23.1	23.0	22.8	22.6	22.5	22.4	22.2
10	25.7	25.5	25.3	25.2	25.0	24.8	24.7
20	51.3	51.0	50.7	50.3	50.0	49.7	49.3
30	77.0	76.5	76.0	75.5	75.0	74.5	74.0
40	102.7	102.0	101.3	100.7	100.0	99.3	98.7
50	128.3	127.5	126.7	125.8	125.0	124.2	123.3

For **147, 146,** and **145** see page 32.

5°

′	L Sin	d	L Tan	c d	L Cot	L Cos		Prop. Pts.			
0	8.94 030		8.94 195		11.05 805	9.99 834	**60**	″	**147**	**146**	**145**	**144**
1	8.94 174	144	8.94 340	145	11.05 660	9.99 833	59	6	14.7	14.6	14.5	14.4
2	8.94 317	143	8.94 485	145	11.05 515	9.99 832	58	7	17.2	17.0	16.9	16.8
3	8.94 461	144	8.94 630	145	11.05 370	9.99 831	57	8	19.6	19.5	19.3	19.2
4	8.94 603	142	8.94 773	143	11.05 227	9.99 830	56	9	22.0	21.9	21.8	21.6
5	8.94 746	143	8.94 917	144	11.05 083	9.99 829	**55**	10	24.5	24.3	24.2	24.0
6	8.94 887	141	8.95 060	143	11.04 940	9.99 828	54	20	49.0	48.7	48.3	48.0
7	8.95 029	142	8.95 202	142	11.04 798	9.99 827	53	30	73.5	73.0	72.5	72.0
8	8.95 170	141	8.95 344	142	11.04 656	9.99 825	52	40	98.0	97.3	96.7	96.0
9	8.95 310	140	8.95 486	142	11.04 514	9.99 824	51	50	122.5	121.7	120.8	120.0
10	8.95 450	140	8.95 627	141	11.04 373	9.99 823	**50**	″	**143**	**142**	**141**	**140**
11	8.95 589	139	8.95 767	140	11.04 233	9.99 822	49	6	14.3	14.2	14.1	14.0
12	8.95 728	139	8.95 908	141	11.04 092	9.99 821	48	7	16.7	16.6	16.4	16.3
13	8.95 867	139	8.96 047	139	11.03 953	9.99 820	47	8	19.1	18.9	18.8	18.7
14	8.96 005	138	8.96 187	140	11.03 813	9.99 819	46	9	21.4	21.3	21.2	21.0
15	8.96 143	138	8.96 325	138	11.03 675	9.99 817	**45**	10	23.8	23.7	23.5	23.3
16	8.96 280	137	8.96 464	139	11.03 536	9.99 816	44	20	47.7	47.3	47.0	46.7
17	8.96 417	137	8.96 602	138	11.03 398	9.99 815	43	30	71.5	71.0	70.5	70.0
18	8.96 553	136	8.96 739	137	11.03 261	9.99 814	42	40	95.3	94.7	94.0	93.3
19	8.96 689	136	8.96 877	138	11.03 123	9.99 813	41	50	119.2	118.3	117.5	116.7
20	8.96 825	136	8.97 013	136	11.02 987	9.99 812	**40**	″	**139**	**138**	**137**	**136**
21	8.96 960	135	8.97 150	137	11.02 850	9.99 810	39	6	13.9	13.8	13.7	13.6
22	8.97 095	135	8.97 285	135	11.02 715	9.99 809	38	7	16.2	16.1	16.0	15.9
23	8.97 229	134	8.97 421	136	11.02 579	9.99 808	37	8	18.5	18.4	18.3	18.1
24	8.97 363	134	8.97 556	135	11.02 444	9.99 807	36	9	20.9	20.7	20.6	20.4
25	8.97 496	133	8.97 691	135	11.02 309	9.99 806	**35**	10	23.2	23.0	22.8	22.7
26	8.97 629	133	8.97 825	134	11.02 175	9.99 804	34	20	46.3	46.0	45.7	45.3
27	8.97 762	133	8.97 959	134	11.02 041	9.99 803	33	30	69.5	69.0	68.5	68.0
28	8.97 894	132	8.98 092	133	11.01 908	9.99 802	32	40	92.7	92.0	91.3	90.7
29	8.98 026	132	8.98 225	133	11.01 775	9.99 801	31	50	115.8	115.0	114.2	113.3
30	8.98 157	131	8.98 358	133	11.01 642	9.99 800	**30**	″	**135**	**134**	**133**	**132**
31	8.98 288	131	8.98 490	132	11.01 510	9.99 798	29	6	13.5	13.4	13.3	13.2
32	8.98 419	131	8.98 622	132	11.01 378	9.99 797	28	7	15.8	15.6	15.5	15.4
33	8.98 549	130	8.98 753	131	11.01 247	9.99 796	27	8	18.0	17.9	17.7	17.6
34	8.98 679	130	8.98 884	131	11.01 116	9.99 795	26	9	20.2	20.1	20.0	19.8
35	8.98 808	129	8.99 015	131	11.00 985	9.99 793	**25**	10	22.5	22.3	22.2	22.0
36	8.98 937	129	8.99 145	130	11.00 855	9.99 792	24	20	45.0	44.7	44.3	44.0
37	8.99 066	129	8.99 275	130	11.00 725	9.99 791	23	30	67.5	67.0	66.5	66.0
38	8.99 194	128	8.99 405	130	11.00 595	9.99 790	22	40	90.0	89.3	88.7	88.0
39	8.99 322	128	8.99 534	129	11.00 466	9.99 788	21	50	112.5	111.7	110.8	110.0
40	8.99 450	128	8.99 662	128	11.00 338	9.99 787	**20**	″	**131**	**130**	**129**	**128**
41	8.99 577	127	8.99 791	129	11.00 209	9.99 786	19	6	13.1	13.0	12.9	12.8
42	8.99 704	127	8.99 919	128	11.00 081	9.99 785	18	7	15.3	15.2	15.0	14.9
43	8.99 830	126	9.00 046	127	10.99 954	9.99 783	17	8	17.5	17.3	17.2	17.1
44	8.99 956	126	9.00 174	128	10.99 826	9.99 782	16	9	19.6	19.5	19.4	19.2
45	9.00 082	126	9.00 301	127	10.99 699	9.99 781	**15**	10	21.8	21.7	21.5	21.3
46	9.00 207	125	9.00 427	126	10.99 573	9.99 780	14	20	43.7	43.3	43.0	42.7
47	9.00 332	125	9.00 553	126	10.99 447	9.99 778	13	30	65.5	65.0	64.5	64.0
48	9.00 456	124	9.00 679	126	10.99 321	9.99 777	12	40	87.3	86.7	86.0	85.3
49	9.00 581	125	9.00 805	126	10.99 195	9.99 776	11	50	109.2	108.3	107.5	106.7
50	9.00 704	123	9.00 930	125	10.99 070	9.99 775	**10**	″	**127**	**126**	**125**	**124**
51	9.00 828	124	9.01 055	125	10.98 945	9.99 773	9	6	12.7	12.6	12.5	12.4
52	9.00 951	123	9.01 179	124	10.98 821	9.99 772	8	7	14.8	14.7	14.6	14.5
53	9.01 074	123	9.01 303	124	10.98 697	9.99 771	7	8	16.9	16.8	16.7	16.5
54	9.01 196	122	9.01 427	124	10.98 573	9.99 769	6	9	19.0	18.9	18.8	18.6
55	9.01 318	122	9.01 550	123	10.98 450	9.99 768	**5**	10	21.2	21.0	20.8	20.7
56	9.01 440	122	9.01 673	123	10.98 327	9.99 767	4	20	42.3	42.0	41.7	41.3
57	9.01 561	121	9.01 796	123	10.98 204	9.99 765	3	30	63.5	63.0	62.5	62.0
58	9.01 682	121	9.01 918	122	10.98 082	9.99 764	2	40	84.7	84.0	83.3	82.7
59	9.01 803	121	9.02 040	122	10.97 960	9.99 763	1	50	105.8	105.0	104.2	103.3
60	9.01 923	120	9.02 162	122	10.97 838	9.99 761	**0**	″	**123**	**122**	**121**	**120**
	L Cos	d	L Cot	c d	L Tan	L Sin	′	6	12.3	12.2	12.1	12.0
								7	14.4	14.2	14.1	14.0
								8	16.4	16.3	16.1	16.0
								9	18.4	18.3	18.2	18.0
								10	20.5	20.3	20.2	20.0
								20	41.0	40.7	40.3	40.0
								30	61.5	61.0	60.5	60.0
								40	82.0	81.3	80.7	80.0
								50	102.5	101.7	100.8	100.0
									Prop. Pts.			

6°

′	L Sin	d	L Tan	c d	L Cot	L Cos		Prop. Pts.		
0	9.01 923		9.02 162		10.97 838	9.99 761	60			
1	9.02 043	120	9.02 283	121	10.97 717	9.99 760	59	″	121	120	119
2	9.02 163	120	9.02 404	121	10.97 596	9.99 759	58	6	12.1	12.0	11.9
3	9.02 283	120	9.02 525	121	10.97 475	9.99 757	57	7	14.1	14.0	13.9
4	9.02 402	119	9.02 645	120	10.97 355	9.99 756	56	8	16.1	16.0	15.9
5	9.02 520	118	9.02 766	121	10.97 234	9.99 755	55	9	18.2	18.0	17.8
6	9.02 639	119	9.02 885	119	10.97 115	9.99 753	54	10	20.2	20.0	19.8
7	9.02 757	118	9.03 005	120	10.96 995	9.99 752	53	20	40.3	40.0	39.7
8	9.02 874	117	9.03 124	119	10.96 876	9.99 751	52	30	60.5	60.0	59.5
9	9.02 992	118	9.03 242	118	10.96 758	9.99 749	51	40	80.7	80.0	79.3
10	9.03 109	117	9.03 361	119	10.96 639	9.99 748	50	50	100.8	100.0	99.2
11	9.03 226	117	9.03 479	118	10.96 521	9.99 747	49	″	118	117	116
12	9.03 342	116	9.03 597	118	10.96 403	9.99 745	48	6	11.8	11.7	11.6
13	9.03 458	116	9.03 714	117	10.96 286	9.99 744	47	7	13.8	13.6	13.5
14	9.03 574	116	9.03 832	118	10.96 168	9.99 742	46	8	15.7	15.6	15.5
15	9.03 690	116	9.03 948	116	10.96 052	9.99 741	45	9	17.7	17.6	17.4
16	9.03 805	115	9.04 065	117	10.95 935	9.99 740	44	10	19.7	19.5	19.3
17	9.03 920	115	9.04 181	116	10.95 819	9.99 738	43	20	39.3	39.0	38.7
18	9.04 034	114	9.04 297	116	10.95 703	9.99 737	42	30	59.0	58.5	58.0
19	9.04 149	115	9.04 413	116	10.95 587	9.99 736	41	40	78.7	78.0	77.3
20	9.04 262	113	9.04 528	115	10.95 472	9.99 734	40	50	98.3	97.5	96.7
21	9.04 376	114	9.04 643	115	10.95 357	9.99 733	39	″	115	114	113
22	9.04 490	114	9.04 758	115	10.95 242	9.99 731	38	6	11.5	11.4	11.3
23	9.04 603	113	9.04 873	115	10.95 127	9.99 730	37	7	13.4	13.3	13.2
24	9.04 715	112	9.04 987	114	10.95 013	9.99 728	36	8	15.3	15.2	15.1
25	9.04 828	113	9.05 101	114	10.94 899	9.99 727	35	9	17.2	17.1	17.0
26	9.04 940	112	9.05 214	113	10.94 786	9.99 726	34	10	19.2	19.0	18.8
27	9.05 052	112	9.05 328	114	10.94 672	9.99 724	33	20	38.3	38.0	37.7
28	9.05 164	112	9.05 441	113	10.94 559	9.99 723	32	30	57.5	57.0	56.5
29	9.05 275	111	9.05 553	112	10.94 447	9.99 721	31	40	76.7	76.0	75.3
30	9.05 386	111	9.05 666	113	10.94 334	9.99 720	30	50	95.8	95.0	94.2
31	9.05 497	111	9.05 778	112	10.94 222	9.99 718	29	″	112	111	110
32	9.05 607	110	9.05 890	112	10.94 110	9.99 717	28	6	11.2	11.1	11.0
33	9.05 717	110	9.06 002	112	10.93 998	9.99 716	27	7	13.1	13.0	12.8
34	9.05 827	110	9.06 113	111	10.93 887	9.99 714	26	8	14.9	14.8	14.7
35	9.05 937	110	9.06 224	111	10.93 776	9.99 713	25	9	16.8	16.6	16.5
36	9.06 046	109	9.06 335	111	10.93 665	9.99 711	24	10	18.7	18.5	18.3
37	9.06 155	109	9.06 445	110	10.93 555	9.99 710	23	20	37.3	37.0	36.7
38	9.06 264	109	9.06 556	111	10.93 444	9.99 708	22	30	56.0	55.5	55.0
39	9.06 372	108	9.06 666	110	10.93 334	9.99 707	21	40	74.7	74.0	73.3
40	9.06 481	109	9.06 775	109	10.93 225	9.99 705	20	50	93.3	92.5	91.7
41	9.06 589	108	9.06 885	110	10.93 115	9.99 704	19	″	109	108	107
42	9.06 696	107	9.06 994	109	10.93 006	9.99 702	18	6	10.9	10.8	10.7
43	9.06 804	108	9.07 103	109	10.92 897	9.99 701	17	7	12.7	12.6	12.5
44	9.06 911	107	9.07 211	108	10.92 789	9.99 699	16	8	14.5	14.4	14.3
45	9.07 018	107	9.07 320	109	10.92 680	9.99 698	15	9	16.4	16.2	16.0
46	9.07 124	106	9.07 428	108	10.92 572	9.99 696	14	10	18.2	18.0	17.8
47	9.07 231	107	9.07 536	108	10.92 464	9.99 695	13	20	36.3	36.0	35.7
48	9.07 337	106	9.07 643	107	10.92 357	9.99 693	12	30	54.5	54.0	53.5
49	9.07 442	105	9.07 751	108	10.92 249	9.99 692	11	40	72.7	72.0	71.3
50	9.07 548	106	9.07 858	107	10.92 142	9.99 690	10	50	90.8	90.0	89.2
51	9.07 653	105	9.07 964	106	10.92 036	9.99 689	9				
52	9.07 758	105	9.08 071	107	10.91 929	9.99 687	8	″	106	105	104
53	9.07 863	105	9.08 177	106	10.91 823	9.99 686	7	6	10.6	10.5	10.4
54	9.07 968	105	9.08 283	106	10.91 717	9.99 684	6	7	12.4	12.2	12.1
55	9.08 072	104	9.08 389	106	10.91 611	9.99 683	5	8	14.1	14.0	13.9
56	9.08 176	104	9.08 495	106	10.91 505	9.99 681	4	9	15.9	15.8	15.6
57	9.08 280	104	9.08 600	105	10.91 400	9.99 680	3	10	17.7	17.5	17.3
58	9.08 383	103	9.08 705	105	10.91 295	9.99 678	2	20	35.3	35.0	34.7
59	9.08 486	103	9.08 810	105	10.91 190	9.99 677	1	30	53.0	52.5	52.0
60	9.08 589	103	9.08 914	104	10.91 086	9.99 675	0	40	70.7	70.0	69.3
								50	88.3	87.5	86.7
	L Cos	d	L Cot	c d	L Tan	L Sin	′	Prop. Pts.		

83°

7°

′	L Sin	d	L Tan	c d	L Cot	L Cos		Prop. Pts.		
0	9.08 589		9.08 914		10.91 086	9.99 675	**60**			
1	9.08 692	103	9.09 019	105	10.90 981	9.99 674	59	″	**105**	**104**	**103**
2	9.08 795	103	9.09 123	104	10.90 877	9.99 672	58	6	10.5	10.4	10.3
3	9.08 897	102	9.09 227	104	10.90 773	9.99 670	57	7	12.3	12.1	12.0
4	9.08 999	102	9.09 330	103	10.90 670	9.99 669	56	8	14.0	13.9	13.7
5	9.09 101	102	9.09 434	104	10.90 566	9.99 667	55	9	15.8	15.6	15.4
6	9.09 202	101	9.09 537	103	10.90 463	9.99 666	54	10	17.5	17.3	17.2
7	9.09 304	102	9.09 640	103	10.90 360	9.99 664	53	20	35.0	34.7	34.3
8	9.09 405	101	9.09 742	102	10.90 258	9.99 663	52	30	52.5	52.0	51.5
9	9.09 506	101	9.09 845	103	10.90 155	9.99 661	51	40	70.0	69.3	68.7
10	9.09 606	100	9.09 947	102	10.90 053	9.99 659	**50**	50	87.5	86.7	85.8
11	9.09 707	101	9.10 049	102	10.89 951	9.99 658	49	″	**102**	**101**	**100**
12	9.09 807	100	9.10 150	101	10.89 850	9.99 656	48	6	10.2	10.1	10.0
13	9.09 907	100	9.10 252	102	10.89 748	9.99 655	47	7	11.9	11.8	11.7
14	9.10 006	99	9.10 353	101	10.89 647	9.99 653	46	8	13.6	13.5	13.3
15	9.10 106	100	9.10 454	101	10.89 546	9.99 651	45	9	15.3	15.2	15.0
16	9.10 205	99	9.10 555	101	10.89 445	9.99 650	44	10	17.0	16.8	16.7
17	9.10 304	99	9.10 656	101	10.89 344	9.99 648	43	20	34.0	33.7	33.3
18	9.10 402	98	9.10 756	100	10.89 244	9.99 647	42	30	51.0	50.5	50.0
19	9.10 501	99	9.10 856	100	10.89 144	9.99 645	41	40	68.0	67.3	66.7
20	9.10 599	98	9.10 956	100	10.89 044	9.99 643	**40**	50	85.0	84.2	83.3
21	9.10 697	98	9.11 056	100	10.88 944	9.99 642	39	″	**99**	**98**	**97**
22	9.10 795	98	9.11 155	99	10.88 845	9.99 640	38	6	9.9	9.8	9.7
23	9.10 893	98	9.11 254	99	10.88 746	9.99 638	37	7	11.6	11.4	11.3
24	9.10 990	97	9.11 353	99	10.88 647	9.99 637	36	8	13.2	13.1	12.9
25	9.11 087	97	9.11 452	99	10.88 548	9.99 635	35	9	14.8	14.7	14.6
26	9.11 184	97	9.11 551	99	10.88 449	9.99 633	34	10	16.5	16.3	16.2
27	9.11 281	97	9.11 649	98	10.88 351	9.99 632	33	20	33.0	32.7	32.3
28	9.11 377	96	9.11 747	98	10.88 253	9.99 630	32	30	49.5	49.0	48.5
29	9.11 474	97	9.11 845	98	10.88 155	9.99 629	31	40	66.0	65.3	64.7
30	9.11 570	96	9.11 943	98	10.88 057	9.99 627	**30**	50	82.5	81.7	80.8
31	9.11 666	96	9.12 040	97	10.87 960	9.99 625	29	″	**96**	**95**	**94**
32	9.11 761	95	9.12 138	98	10.87 862	9.99 624	28	6	9.6	9.5	9.4
33	9.11 857	96	9.12 235	97	10.87 765	9.99 622	27	7	11.2	11.1	11.0
34	9.11 952	95	9.12 332	97	10.87 668	9.99 620	26	8	12.8	12.7	12.5
35	9.12 047	95	9.12 428	96	10.87 572	9.99 618	25	9	14.4	14.2	14.1
36	9.12 142	95	9.12 525	97	10.87 475	9.99 617	24	10	16.0	15.8	15.7
37	9.12 236	94	9.12 621	96	10.87 379	9.99 615	23	20	32.0	31.7	31.3
38	9.12 331	95	9.12 717	96	10.87 283	9.99 613	22	30	48.0	47.5	47.0
39	9.12 425	94	9.12 813	96	10.87 187	9.99 612	21	40	64.0	63.3	62.7
40	9.12 519	94	9.12 909	96	10.87 091	9.99 610	**20**	50	80.0	79.2	78.3
41	9.12 612	93	9.13 004	95	10.86 996	9.99 608	19	″	**93**	**92**	**91**
42	9.12 706	94	9.13 099	95	10.86 901	9.99 607	18	6	9.3	9.2	9.1
43	9.12 799	93	9.13 194	95	10.86 806	9.99 605	17	7	10.9	10.7	10.6
44	9.12 892	93	9.13 289	95	10.86 711	9.99 603	16	8	12.4	12.3	12.1
45	9.12 985	93	9.13 384	95	10.86 616	9.99 601	15	9	14.0	13.8	13.6
46	9.13 078	93	9.13 478	94	10.86 522	9.99 600	14	10	15.5	15.3	15.2
47	9.13 171	93	9.13 573	95	10.86 427	9.99 598	13	20	31.0	30.7	30.3
48	9.13 263	92	9.13 667	94	10.86 333	9.99 596	12	30	46.5	46.0	45.5
49	9.13 355	92	9.13 761	94	10.86 239	9.99 595	11	40	62.0	61.3	60.7
50	9.13 447	92	9.13 854	93	10.86 146	9.99 593	**10**	50	77.5	76.7	75.8
51	9.13 539	92	9.13 948	94	10.86 052	9.99 591	9				
52	9.13 630	91	9.14 041	93	10.85 959	9.99 589	8	″	**90**	**2**	**1**
53	9.13 722	92	9.14 134	93	10.85 866	9.99 588	7	6	9.0	0.2	0.1
54	9.13 813	91	9.14 227	93	10.85 773	9.99 586	6	7	10.5	0.2	0.1
55	9.13 904	91	9.14 320	93	10.85 680	9.99 584	5	8	12.0	0.3	0.1
56	9.13 994	90	9.14 412	92	10.85 588	9.99 582	4	9	13.5	0.3	0.2
57	9.14 085	91	9.14 504	92	10.85 496	9.99 581	3	10	15.0	0.3	0.2
58	9.14 175	90	9.14 597	93	10.85 403	9.99 579	2	20	30.0	0.7	0.3
59	9.14 266	91	9.14 688	91	10.85 312	9.99 577	1	30	45.0	1.0	0.5
60	9.14 356	90	9.14 780	92	10.85 220	9.99 575	**0**	40	60.0	1.3	0.7
								50	75.0	1.7	0.8
	L Cos	d	L Cot	c d	L Tan	L Sin	′	Prop. Pts.		

82°

8°

′	L Sin	d	L Tan	c d	L Cot	L Cos		Prop. Pts.
0	9.14 356		9.14 780		10.85 220	9.99 575	**60**	
1	9.14 445	89	9.14 872	92	10.85 128	9.99 574	59	
2	9.14 535	90	9.14 963	91	10.85 037	9.99 572	58	
3	9.14 624	89	9.15 054	91	10.84 946	9.99 570	57	″ | **92** | **91** | **90**
4	9.14 714	90	9.15 145	91	10.84 855	9.99 568	56	
5	9.14 803	89	9.15 236	91	10.84 764	9.99 566	55	6 | 9.2 | 9.1 | 9.0
6	9.14 891	88	9.15 327	91	10.84 673	9.99 565	54	7 | 10.7 | 10.6 | 10.5
7	9.14 980	89	9.15 417	90	10.84 583	9.99 563	53	8 | 12.3 | 12.1 | 12.0
8	9.15 069	89	9.15 508	91	10.84 492	9.99 561	52	9 | 13.8 | 13.6 | 13.5
9	9.15 157	88	9.15 598	90	10.84 402	9.99 559	51	10 | 15.3 | 15.2 | 15.0
10	9.15 245	88	9.15 688	90	10.84 312	9.99 557	**50**	20 | 30.7 | 30.3 | 30.0
11	9.15 333	88	9.15 777	89	10.84 223	9.99 556	49	30 | 46.0 | 45.5 | 45.0
12	9.15 421	88	9.15 867	90	10.84 133	9.99 554	48	40 | 61.3 | 60.7 | 60.0
13	9.15 508	87	9.15 956	89	10.84 044	9.99 552	47	50 | 76.7 | 75.8 | 75.0
14	9.15 596	88	9.16 046	90	10.83 954	9.99 550	46	
15	9.15 683	87	9.16 135	89	10.83 865	9.99 548	45	″ | **89** | **88** | **87**
16	9.15 770	87	9.16 224	89	10.83 776	9.99 546	44	
17	9.15 857	87	9.16 312	88	10.83 688	9.99 545	43	6 | 8.9 | 8.8 | 8.7
18	9.15 944	87	9.16 401	89	10.83 599	9.99 543	42	7 | 10.4 | 10.3 | 10.2
19	9.16 030	86	9.16 489	88	10.83 511	9.99 541	41	8 | 11.9 | 11.7 | 11.6
20	9.16 116	86	9.16 577	88	10.83 423	9.99 539	**40**	9 | 13.4 | 13.2 | 13.0
21	9.16 203	87	9.16 665	88	10.83 335	9.99 537	39	10 | 14.8 | 14.7 | 14.5
22	9.16 289	86	9.16 753	88	10.83 247	9.99 535	38	20 | 29.7 | 29.3 | 29.0
23	9.16 374	85	9.16 841	88	10.83 159	9.99 533	37	30 | 44.5 | 44.0 | 43.5
24	9.16 460	86	9.16 928	87	10.83 072	9.99 532	36	40 | 59.3 | 58.7 | 58.0
25	9.16 545	85	9.17 016	88	10.82 984	9.99 530	35	50 | 74.2 | 73.3 | 72.5
26	9.16 631	86	9.17 103	87	10.82 897	9.99 528	34	
27	9.16 716	85	9.17 190	87	10.82 810	9.99 526	33	″ | **86** | **85** | **84**
28	9.16 801	85	9.17 277	87	10.82 723	9.99 524	32	
29	9.16 886	85	9.17 363	86	10.82 637	9.99 522	31	6 | 8.6 | 8.5 | 8.4
30	9.16 970	84	9.17 450	87	10.82 550	9.99 520	**30**	7 | 10.0 | 9.9 | 9.8
31	9.17 055	85	9.17 536	86	10.82 464	9.99 518	29	8 | 11.5 | 11.3 | 11.2
32	9.17 139	84	9.17 622	86	10.82 378	9.99 517	28	9 | 12.9 | 12.8 | 12.6
33	9.17 223	84	9.17 708	86	10.82 292	9.99 515	27	10 | 14.3 | 14.2 | 14.0
34	9.17 307	84	9.17 794	86	10.82 206	9.99 513	26	20 | 28.7 | 28.3 | 28.0
35	9.17 391	84	9.17 880	86	10.82 120	9.99 511	25	30 | 43.0 | 42.5 | 42.0
36	9.17 474	83	9.17 965	85	10.82 035	9.99 509	24	40 | 57.3 | 56.7 | 56.0
37	9.17 558	84	9.18 051	86	10.81 949	9.99 507	23	50 | 71.7 | 70.8 | 70.0
38	9.17 641	83	9.18 136	85	10.81 864	9.99 505	22	
39	9.17 724	83	9.18 221	85	10.81 779	9.99 503	21	″ | **83** | **82** | **81**
40	9.17 807	83	9.18 306	85	10.81 694	9.99 501	**20**	
41	9.17 890	83	9.18 391	85	10.81 609	9.99 499	19	6 | 8.3 | 8.2 | 8.1
42	9.17 973	83	9.18 475	84	10.81 525	9.99 497	18	7 | 9.7 | 9.6 | 9.4
43	9.18 055	82	9.18 560	85	10.81 440	9.99 495	17	8 | 11.1 | 10.9 | 10.8
44	9.18 137	82	9.18 644	84	10.81 356	9.99 494	16	9 | 12.4 | 12.3 | 12.2
45	9.18 220	83	9.18 728	84	10.81 272	9.99 492	15	10 | 13.8 | 13.7 | 13.5
46	9.18 302	82	9.18 812	84	10.81 188	9.99 490	14	20 | 27.7 | 27.3 | 27.0
47	9.18 383	81	9.18 896	84	10.81 104	9.99 488	13	30 | 41.5 | 41.0 | 40.5
48	9.18 465	82	9.18 979	83	10.81 021	9.99 486	12	40 | 55.3 | 54.7 | 54.0
49	9.18 547	82	9.19 063	84	10.80 937	9.99 484	11	50 | 69.2 | 68.3 | 67.5
50	9.18 628	81	9.19 146	83	10.80 854	9.99 482	**10**	
51	9.18 709	81	9.19 229	83	10.80 771	9.99 480	9	″ | **80** | **2** | **1**
52	9.18 790	81	9.19 312	83	10.80 688	9.99 478	8	
53	9.18 871	81	9.19 395	83	10.80 605	9.99 476	7	6 | 8.0 | 0.2 | 0.1
54	9.18 952	81	9.19 478	83	10.80 522	9.99 474	6	7 | 9.3 | 0.2 | 0.1
55	9.19 033	81	9.19 561	83	10.80 439	9.99 472	5	8 | 10.7 | 0.3 | 0.1
56	9.19 113	80	9.19 643	82	10.80 357	9.99 470	4	9 | 12.0 | 0.3 | 0.2
57	9.19 193	80	9.19 725	82	10.80 275	9.99 468	3	10 | 13.3 | 0.3 | 0.2
58	9.19 273	80	9.19 807	82	10.80 193	9.99 466	2	20 | 26.7 | 0.7 | 0.3
59	9.19 353	80	9.19 889	82	10.80 111	9.99 464	1	30 | 40.0 | 1.0 | 0.5
60	9.19 433	80	9.19 971	82	10.80 029	9.99 462	**0**	40 | 53.3 | 1.3 | 0.7
	L Cos	d	L Cot	c d	L Tan	L Sin	′	50 | 66.7 | 1.7 | 0.8
								Prop. Pts.

81°

9°

′	L Sin	d	L Tan	c d	L Cot	L Cos		Prop. Pts.		
0	9.19 433		9.19 971		10.80 029	9.99 462	**60**			
1	9.19 513	80	9.20 053	82	10.79 947	9.99 460	59			
2	9.19 592	79	9.20 134	81	10.79 866	9.99 458	58			
3	9.19 672	80	9.20 216	82	10.79 784	9.99 456	57			
4	9.19 751	79	9.20 297	81	10.79 703	9.99 454	56			
5	9.19 830	79	9.20 378	81	10.79 622	9.99 452	55			
6	9.19 909	79	9.20 459	81	10.79 541	9.99 450	54	″	**80**	**79**	**78**
7	9.19 988	79	9.20 540	81	10.79 460	9.99 448	53				
8	9.20 067	79	9.20 621	81	10.79 379	9.99 446	52	6	8.0	7.9	7.8
9	9.20 145	78	9.20 701	80	10.79 299	9.99 444	51	7	9.3	9.2	9.1
10	9.20 223	78	9.20 782	81	10.79 218	9.99 442	**50**	8	10.7	10.5	10.4
11	9.20 302	79	9.20 862	80	10.79 138	9.99 440	49	9	12.0	11.8	11.7
12	9.20 380	78	9.20 942	80	10.79 058	9.99 438	48	10	13.3	13.2	13.0
13	9.20 458	78	9.21 022	80	10.78 978	9.99 436	47	20	26.7	26.3	26.0
14	9.20 535	77	9.21 102	80	10.78 898	9.99 434	46	30	40.0	39.5	39.0
15	9.20 613	78	9.21 182	80	10.78 818	9.99 432	45	40	53.3	52.7	52.0
16	9.20 691	78	9.21 261	79	10.78 739	9.99 429	44	50	66.7	65.8	65.0
17	9.20 768	77	9.21 341	80	10.78 659	9.99 427	43				
18	9.20 845	77	9.21 420	79	10.78 580	9.99 425	42				
19	9.20 922	77	9.21 499	79	10.78 501	9.99 423	41				
20	9.20 999	77	9.21 578	79	10.78 422	9.99 421	**40**	″	**77**	**76**	**75**
21	9.21 076	77	9.21 657	79	10.78 343	9.99 419	39	6	7.7	7.6	7.5
22	9.21 153	77	9.21 736	78	10.78 264	9.99 417	38	7	9.0	8.9	8.8
23	9.21 229	76	9.21 814	79	10.78 186	9.99 415	37	8	10.3	10.1	10.0
24	9.21 306	77	9.21 893	78	10.78 107	9.99 413	36	9	11.6	11.4	11.2
25	9.21 382	76	9.21 971	78	10.78 029	9.99 411	35	10	12.8	12.7	12.5
26	9.21 458	76	9.22 049	78	10.77 951	9.99 409	34	20	25.7	25.3	25.0
27	9.21 534	76	9.22 127	78	10.77 873	9.99 407	33	30	38.5	38.0	37.5
28	9.21 610	76	9.22 205	78	10.77 795	9.99 404	32	40	51.3	50.7	50.0
29	9.21 685	75	9.22 283	78	10.77 717	9.99 402	31	50	64.2	63.3	62.5
30	9.21 761	76	9.22 361	78	10.77 639	9.99 400	**30**				
31	9.21 836	75	9.22 438	77	10.77 562	9.99 398	29				
32	9.21 912	76	9.22 516	78	10.77 484	9.99 396	28				
33	9.21 987	75	9.22 593	77	10.77 407	9.99 394	27	″	**74**	**73**	**72**
34	9.22 062	75	9.22 670	77	10.77 330	9.99 392	26				
35	9.22 137	75	9.22 747	77	10.77 253	9.99 390	25	6	7.4	7.3	7.2
36	9.22 211	74	9.22 824	77	10.77 176	9.99 388	24	7	8.6	8.5	8.4
37	9.22 286	75	9.22 901	77	10.77 099	9.99 385	23	8	9.9	9.7	9.6
38	9.22 361	75	9.22 977	76	10.77 023	9.99 383	22	9	11.1	11.0	10.8
39	9.22 435	74	9.23 054	77	10.76 946	9.99 381	21	10	12.3	12.2	12.0
40	9.22 509	74	9.23 130	76	10.76 870	9.99 379	**20**	20	24.7	24.3	24.0
41	9.22 583	74	9.23 206	76	10.76 794	9.99 377	19	30	37.0	36.5	36.0
42	9.22 657	74	9.23 283	77	10.76 717	9.99 375	18	40	49.3	48.7	48.0
43	9.22 731	74	9.23 359	76	10.76 641	9.99 372	17	50	61.7	60.8	60.0
44	9.22 805	74	9.23 435	76	10.76 565	9.99 370	16				
45	9.22 878	73	9.23 510	75	10.76 490	9.99 368	15				
46	9.22 952	74	9.23 586	76	10.76 414	9.99 366	14	″	**71**	**3**	**2**
47	9.23 025	73	9.23 661	75	10.76 339	9.99 364	13				
48	9.23 098	73	9.23 737	76	10.76 263	9.99 362	12	6	7.1	0.3	0.2
49	9.23 171	73	9.23 812	75	10.76 188	9.99 359	11	7	8.3	0.4	0.2
50	9.23 244	73	9.23 887	75	10.76 113	9.99 357	**10**	8	9.5	0.4	0.3
51	9.23 317	73	9.23 962	75	10.76 038	9.99 355	9	9	10.6	0.4	0.3
52	9.23 390	73	9.24 037	75	10.75 963	9.99 353	8	10	11.8	0.5	0.3
53	9.23 462	72	9.24 112	75	10.75 888	9.99 351	7	20	23.7	1.0	0.7
54	9.23 535	73	9.24 186	74	10.75 814	9.99 348	6	30	35.5	1.5	1.0
55	9.23 607	72	9.24 261	75	10.75 739	9.99 346	5	40	47.3	2.0	1.3
56	9.23 679	72	9.24 335	74	10.75 665	9.99 344	4	50	59.2	2.5	1.7
57	9.23 752	73	9.24 410	75	10.75 590	9.99 342	3				
58	9.23 823	71	9.24 484	74	10.75 516	9.99 340	2				
59	9.23 895	72	9.24 558	74	10.75 442	9.99 337	1				
60	9.23 967	72	9.24 632	74	10.75 368	9.99 335	**0**				
	L Cos	d	L Cot	c d	L Tan	L Sin	′	Prop. Pts.		

80°

10°

′	L Sin	d	L Tan	c d	L Cot	L Cos		Prop. Pts.		
0	9.23 967		9.24 632		10.75 368	9.99 335	**60**			
1	9.24 039	72	9.24 706	74	10.75 294	9.99 333	59			
2	9.24 110	71	9.24 779	73	10.75 221	9.99 331	58			
3	9.24 181	71	9.24 853	74	10.75 147	9.99 328	57			
4	9.24 253	72	9.24 926	73	10.75 074	9.99 326	56			
5	9.24 324	71	9.25 000	74	10.75 000	9.99 324	55	″	**74**	**73**	**72**
6	9.24 395	71	9.25 073	73	10.74 927	9.99 322	54				
7	9.24 466	71	9.25 146	73	10.74 854	9.99 319	53	6	7.4	7.3	7.2
8	9.24 536	70	9.25 219	73	10.74 781	9.99 317	52	7	8.6	8.5	8.4
9	9.24 607	71	9.25 292	73	10.74 708	99.9 315	51	8	9.9	9.7	9.6
10	9.24 677	70	9.25 365	73	10.74 635	9.99 313	**50**	9	11.1	11.0	10.8
11	9.24 748	71	9.25 437	72	10.74 563	9.99 310	49	10	12.3	12.2	12.0
12	9.24 818	70	9.25 510	73	10.74 490	9.99 308	48	20	24.7	24.3	24.0
13	9.24 888	70	9.25 582	72	10.74 418	9.99 306	47	30	37.0	36.5	36.0
14	9.24 958	70	9.25 655	73	10.74 345	9.99 304	46	40	49.3	48.7	48.0
15	9.25 028	70	9.25 727	72	10.74 273	9.99 301	45	50	61.7	60.8	60.0
16	9.25 098	70	9.25 799	72	10.74 201	9.99 299	44				
17	9.25 168	70	9.25 871	72	10.74 129	9.99 297	43				
18	8.25 237	69	9.25 943	72	10.74 057	9.99 294	42				
19	9.25 307	70	9.26 015	72	10.73 985	9.99 292	41	″	**71**	**70**	**69**
20	9.25 376	69	9.26 086	71	10.73 914	9.99 290	**40**				
21	9.25 445	69	9.26 158	72	10.73 842	9.99 288	39	6	7.1	7.0	6.9
22	9.25 514	69	9.26 229	71	10.73 771	9.99 285	38	7	8.3	8.2	8.0
23	9.25 583	69	9.26 301	72	10.73 699	9.99 283	37	8	9.5	9.3	9.2
24	9.25 652	69	9.26 372	71	10.73 628	9.99 281	36	9	10.6	10.5	10.4
25	9.25 721	69	9.26 443	71	10.73 557	9.99 278	35	10	11.8	11.7	11.5
26	9.25 790	69	9.26 514	71	10.73 486	9.99 276	34	20	23.7	23.3	23.0
27	9.25 858	68	9.26 585	71	10.73 415	9.99 274	33	30	35.5	35.0	34.5
28	9.25 927	69	9.26 655	70	10.73 345	9.99 271	32	40	47.3	46.7	46.0
29	9.25 995	68	9.26 726	71	10.73 274	9.99 269	31	50	59.2	58.3	57.5
30	9.26 063	68	9.26 797	71	10.73 203	9.99 267	**30**				
31	9.26 131	68	9.26 867	70	10.73 133	9.99 264	29				
32	9.26 199	68	9.26 937	70	10.73 063	9.99 262	28				
33	9.26 267	68	9.27 008	71	10.72 992	9.99 260	27	″	**68**	**67**	**66**
34	9.26 335	68	9.27 078	70	10.72 922	9.99 257	26				
35	9.26 403	68	9.27 148	70	10.72 852	9.99 255	25	6	6.8	6.7	6.6
36	9.26 470	67	9.27 218	70	10.72 782	9.99 252	24	7	7.9	7.8	7.7
37	9.26 538	68	9.27 288	70	10.72 712	9.99 250	23	8	9.1	8.9	8.8
38	9.26 605	67	9.27 357	69	10.72 643	9.99 248	22	9	10.2	10.0	9.9
39	9.26 672	67	9.27 427	70	10.72 573	9.99 245	21	10	11.3	11.2	11.0
40	9.26 739	67	9.27 496	69	10.72 504	9.99 243	**20**	20	22.7	22.3	22.0
41	9.26 806	67	9.27 566	70	10.72 434	9.99 241	19	30	34.0	33.5	33.0
42	9.26 873	67	9.27 635	69	10.72 365	9.99 238	18	40	45.3	44.7	44.0
43	9.26 940	67	9.27 704	69	10.72 296	9.99 236	17	50	56.7	55.8	55.0
44	9.27 007	67	9.27 773	69	10.72 227	9.99 233	16				
45	9.27 073	66	9.27 842	69	10.72 158	9.99 231	15				
46	9.27 140	67	9.27 911	69	10.72 089	9.99 229	14				
47	9.27 206	66	9.27 980	69	10.72 020	9.99 226	13	″	**65**	**3**	**2**
48	9.27 273	67	9.28 049	69	10.71 951	9.99 224	12				
49	9.27 339	66	9.28 117	68	10.71 883	9.99 221	11	6	6.5	0.3	0.2
50	9.27 405	66	9.28 186	69	10.71 814	9.99 219	**10**	7	7.6	0.4	0.2
51	9.27 471	66	9.28 254	68	10.71 746	9.99 217	9	8	8.7	0.4	0.3
52	9.27 537	66	9.28 323	69	10.71 677	9.99 214	8	9	9.8	0.4	0.3
53	9.27 602	65	9.28 391	68	10.71 609	9.99 212	7	10	10.8	0.5	0.3
54	9.27 668	66	9.28 459	68	10.71 541	9.99 209	6	20	21.7	1.0	0.7
55	9.27 734	66	9.28 527	68	10.71 473	9.99 207	5	30	32.5	1.5	1.0
56	9.27 799	65	9.28 595	68	10.71 405	9.99 204	4	40	43.3	2.0	1.3
57	9.27 864	65	9.28 662	67	10.71 338	9.99 202	3	50	54.2	2.5	1.7
58	9.27 930	66	9.28 730	68	10.71 270	9.99 200	2				
59	9.27 995	65	9.28 798	68	10.71 202	9.99 197	1				
60	9.28 060	65	9.28 865	67	10.71 135	9.99 195	**0**				
	L Cos	d	L Cot	c d	L Tan	L Sin	′	Prop. Pts.		

79°

11°

′	L Sin	d	L Tan	c d	L Cot	L Cos		Prop. Pts.		
0	9.28 060		9.28 865		10.71 135	9.99 195	**60**			
1	9.28 125	65	9.28 933	68	10.71 067	9.99 192	59			
2	9.28 190	65	9.29 000	67	10.71 000	9.99 190	58			
3	9.28 254	64	9.29 067	67	10.70 933	9.99 187	57			
4	9.28 319	65	9.29 134	67	10.70 866	9.99 185	56			
5	9.28 384	65	9.29 201	67	10.70 799	9.99 182	55	″	**68**	**67**	**66**
6	9.28 448	64	9.29 268	67	10.70 732	9.99 180	54				
7	9.28 512	64	9.29 335	67	10.70 665	9.99 177	53	6	6.8	6.7	6.6
8	9.28 577	65	9.29 402	67	10.70 598	9.99 175	52	7	7.9	7.8	7.7
9	9.28 641	64	9.29 468	66	10.70 532	9.99 172	51	8	9.1	8.9	8.8
10	9.28 705	64	9.29 535	67	10.70 465	9.99 170	**50**	9	10.2	10.0	9.9
11	9.28 769	64	9.29 601	66	10.70 399	9.99 167	49	10	11.3	11.2	11.0
12	9.28 833	64	9.29 668	67	10.70 332	9.99 165	48	20	22.7	22.3	22.0
13	9.28 896	63	9.29 734	66	10.70 266	9.99 162	47	30	34.0	33.5	33.0
14	9.28 960	64	9.29 800	66	10.70 200	9.99 160	46	40	45.3	44.7	44.0
15	9.29 024	64	9.29 866	66	10.70 134	9.99 157	45	50	56.7	55.8	55.0
16	9.29 087	63	9.29 932	66	10.70 068	9.99 155	44				
17	9.29 150	63	9.29 998	66	10.70 002	9.99 152	43				
18	9.29 214	64	9.30 064	66	10.69 936	9.99 150	42				
19	9.29 277	63	9.30 130	66	10.69 870	9.99 147	41	″	**65**	**64**	**63**
20	9.29 340	63	9.30 195	65	10.69 805	9.99 145	**40**				
21	9.29 403	63	9.30 261	66	10.69 739	9.99 142	39	6	6.5	6.4	6.3
22	9.29 466	63	9.30 326	65	10.69 674	9.99 140	38	7	7.6	7.5	7.4
23	9.29 529	63	9.30 391	65	10.69 609	9.99 137	37	8	8.7	8.5	8.4
24	9.29 591	62	9.30 457	66	10.69 543	9.99 135	36	9	9.8	9.6	9.4
25	9.29 654	63	9.30 522	65	10.69 478	9.99 132	35	10	10.8	10.7	10.5
26	9.29 716	62	9.30 587	65	10.69 413	9.99 130	34	20	21.7	21.3	21.0
27	9.29 779	63	9.30 652	65	10.69 348	9.99 127	33	30	32.5	32.0	31.5
28	9.29 841	62	9.30 717	65	10.69 283	9.99 124	32	40	43.3	42.7	42.0
29	9.29 903	62	9.30 782	65	10.69 218	9.99 122	31	50	54.2	53.3	52.5
30	9.29 966	63	9.30 846	64	10.69 154	9.99 119	**30**				
31	9.30 028	62	9.30 911	65	10.69 089	9.99 117	29				
32	9.30 090	62	9.30 975	64	10.69 025	9.99 114	28				
33	9.30 151	61	9.31 040	65	10.68 960	9.99 112	27	″	**62**	**61**	**60**
34	9.30 213	62	9.31 104	64	10.68 896	9.99 109	26				
35	9.30 275	62	9.31 168	64	10.68 832	9.99 106	25	6	6.2	6.1	6.0
36	9.30 336	61	9.31 233	65	10.68 767	9.99 104	24	7	7.2	7.1	7.0
37	9.30 398	62	9.31 297	64	10.68 703	9.99 101	23	8	8.3	8.1	8.0
38	9.30 459	61	9.31 361	64	10.68 639	9.99 099	22	9	9.3	9.2	9.0
39	9.30 521	62	9.31 425	64	10.68 575	9.99 096	21	10	10.3	10.2	10.0
40	9.30 582	61	9.31 489	64	10.68 511	9.99 093	**20**	20	20.7	20.3	20.0
41	9.30 643	61	9.31 552	63	10.68 448	9.99 091	19	30	31.0	30.5	30.0
42	9.30 704	61	9.31 616	64	10.68 384	9.99 088	18	40	41.3	40.7	40.0
43	9.30 765	61	9.31 679	63	10.68 321	9.99 086	17	50	51.7	50.8	50.0
44	9.30 826	61	9.31 743	64	10.68 257	9.99 083	16				
45	9.30 887	60	9.31 806	63	10.68 194	9.99 080	15				
46	9.30 947	61	9.31 870	64	10.68 130	9.99 078	14				
47	9.31 008	60	9.31 933	63	10.68 067	9.99 075	13	″	**59**	**3**	**2**
48	9.31 068	61	9.31 996	63	10.68 004	9.99 072	12				
49	9.31 129	60	9.32 059	63	10.67 941	9.99 070	11	6	5.9	0.3	0.2
50	9.31 189	61	9.32 122	63	10.67 878	9.99 067	**10**	7	6.9	0.4	0.2
51	9.31 250	60	9.32 185	63	10.67 815	9.99 064	9	8	7.9	0.4	0.3
52	9.31 310	60	9.32 248	63	10.67 752	9.99 062	8	9	8.8	0.5	0.3
53	9.31 370	60	9.32 311	63	10.67 689	9.99 059	7	10	9.8	0.5	0.3
54	9.31 430	60	9.32 373	62	10.67 627	9.99 056	6	20	19.7	1.0	0.7
55	9.31 490	60	9.32 436	63	10.67 564	9.99 054	5	30	29.5	1.5	1.0
56	9.31 549	59	9.32 498	62	10.67 502	9.99 051	4	40	39.3	2.0	1.3
57	9.31 609	60	9.32 561	63	10.67 439	9.99 048	3	50	49.2	2.5	1.7
58	9.31 669	60	9.32 623	62	10.67 377	9.99 046	2				
59	9.31 728	59	9.32 685	62	10.67 315	9.99 043	1				
60	9.31 788	60	9.32 747	62	10.67 253	9.99 040	**0**				
	L Cos	d	L Cot	c d	L Tan	L Sin	′	Prop. Pts.		

78°

12°

′	L Sin	d	L Tan	c d	L Cot	L Cos		Prop. Pts.
0	9.31 788		9.32 747		10.67 253	9.99 040	**60**	
1	9.31 847	59	9.32 810	63	10.67 190	9.99 038	59	
2	9.31 907	60	9.32 872	62	10.67 128	9.99 035	58	
3	9.31 966	59	9.32 933	61	10.67 067	9.99 032	57	
4	9.32 025	59	9.32 995	62	10.67 005	9.99 030	56	
5	9.32 084	59	9.33 057	62	10.66 943	9.99 027	55	
6	9.32 143	59	9.33 119	62	10.66 881	9.99 024	54	
7	9.32 202	59	9.33 180	61	10.66 820	9.99 022	53	
8	9.32 261	59	9.33 242	62	10.66 758	9.99 019	52	
9	9.32 319	58	9.33 303	61	10.66 697	9.99 016	51	
10	9.32 378	59	9.33 365	62	10.66 635	9.99 013	**50**	
11	9.32 437	59	9.33 426	61	10.66 574	9.99 011	49	
12	9.32 495	58	9.33 487	61	10.66 513	9.99 008	48	
13	9.32 553	58	9.33 548	61	10.66 452	9.99 005	47	
14	9.32 612	59	9.33 609	61	10.66 391	9.99 002	46	
15	9.32 670	58	9.33 670	61	10.66 330	9.99 000	45	
16	9.32 728	58	9.33 731	61	10.66 269	9.98 997	44	
17	9.32 786	58	9.33 792	61	10.66 208	9.98 994	43	
18	9.32 844	58	9.33 853	61	10.66 147	9.98 991	42	
19	9.32 902	58	9.33 913	60	10.66 087	9.98 989	41	
20	9.32 960	58	9.33 974	61	10.66 026	9.98 986	**40**	
21	9.33 018	58	9.34 034	60	10.65 966	9.98 983	39	
22	9.33 075	57	9.34 095	61	10.65 905	9.98 980	38	
23	9.33 133	58	9.34 155	60	10.65 845	9.98 978	37	
24	9.33 190	57	9.34 215	60	10.65 785	9.98 975	36	
25	9.33 248	58	9.34 276	61	10.65 724	9.98 972	35	
26	9.33 305	57	9.34 336	60	10.65 664	9.98 969	34	
27	9.33 362	57	9.34 396	60	10.65 604	9.98 967	33	
28	9.33 420	58	9.34 456	60	10.65 544	9.98 964	32	
29	9.33 477	57	9.34 516	60	10.65 484	9.98 961	31	
30	9.33 534	57	9.34 576	60	10.65 424	9.98 958	**30**	
31	9.33 591	57	9.34 635	59	10.65 365	9.98 955	29	
32	9.33 647	56	9.34 695	60	10.65 305	9.98 953	28	
33	9.33 704	57	9.34 755	60	10.65 245	9.98 950	27	
34	9.33 761	57	9.34 814	59	10.65 186	9.98 947	26	
35	9.33 818	57	9.34 874	60	10.65 126	9.98 944	25	
36	9.33 874	56	9.34 933	59	10.65 067	9.98 941	24	
37	9.33 931	57	9.34 992	59	10.65 008	9.98 938	23	
38	9.33 987	56	9.35 051	59	10.64 949	9.98 936	22	
39	9.34 043	56	9.35 111	60	10.64 889	9.98 933	21	
40	9.34 100	57	9.35 170	59	10.64 830	9.98 930	**20**	
41	9.34 156	56	9.35 229	59	10.64 771	9.98 927	19	
42	9.34 212	56	9.35 288	59	10.64 712	9.98 924	18	
43	9.34 268	56	9.35 347	59	10.64 653	9.98 921	17	
44	9.34 324	56	9.35 405	58	10.64 595	9.98 919	16	
45	9.34 380	56	9.35 464	59	10.64 536	9.98 916	15	
46	9.34 436	55	9.35 523	59	10.64 477	9.98 913	14	
47	9.34 491	56	9.35 581	58	10.64 419	9.98 910	13	
48	9.34 547	55	9.35 640	59	10.64 360	9.98 907	12	
49	9.34 602	56	9.35 698	58	10.64 302	9.98 904	11	
50	9.34 658	55	9.35 757	59	10.64 243	9.98 901	**10**	
51	9.34 713	56	9.35 815	58	10.64 185	9.98 898	9	
52	9.34 769	55	9.35 873	58	10.64 127	9.98 896	8	
53	9.34 824	55	9.35 931	58	10.64 069	9.98 893	7	
54	9.34 879	55	9.35 989	58	10.64 011	9.98 890	6	
55	9.34 934	55	9.36 047	58	10.63 953	9.98 887	5	
56	9.34 989	55	9.36 105	58	10.63 895	9.98 884	4	
57	9.35 044	55	9.36 163	58	10.63 837	9.98 881	3	
58	9.35 099	55	9.36 221	58	10.63 779	9.98 878	2	
59	9.35 154	55	9.36 279	58	10.63 721	9.98 875	1	
60	9.35 209	55	9.36 336	57	10.63 664	9.98 872	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	′	Prop. Pts.

″	63	62	61
6	6.3	6.2	6.1
7	7.4	7.2	7.1
8	8.4	8.3	8.1
9	9.4	9.3	9.2
10	10.5	10.3	10.2
20	21.0	20.7	20.3
30	31.5	31.0	30.5
40	42.0	41.3	40.7
50	52.5	51.7	50.8

″	60	59	58
6	6.0	5.9	5.8
7	7.0	6.9	6.8
8	8.0	7.9	7.7
9	9.0	8.8	8.7
10	10.0	9.8	9.7
20	20.0	19.7	19.3
30	30.0	29.5	29.0
40	40.0	39.3	38.7
50	50.0	49.2	48.3

″	57	56	55
6	5.7	5.6	5.5
7	6.6	6.5	6.4
8	7.6	7.5	7.3
9	8.6	8.4	8.2
10	9.5	9.3	9.2
20	19.0	18.7	18.3
30	28.5	28.0	27.5
40	38.0	37.3	36.7
50	47.5	46.7	45.8

″	3	2
6	0.3	0.2
7	0.4	0.2
8	0.4	0.3
9	0.5	0.3
10	0.5	0.3
20	1.0	0.7
30	1.5	1.0
40	2.0	1.3
50	2.5	1.7

77°

13°

′	L Sin	d	L Tan	c d	L Cot	L Cos		Prop. Pts.
0	9.35 209		9.36 336		10.63 664	9.98 872	**60**	
1	9.35 263	54	9.36 394	58	10.63 606	9.98 869	59	
2	9.35 318	55	9.36 452	58	10.63 548	9.98 867	58	
3	9.35 373	55	9.36 509	57	10.63 491	9.98 864	57	
4	9.35 427	54	9.36 566	57	10.63 434	9.98 861	56	
5	9.35 481	54	9.36 624	58	10.63 376	9.98 858	55	
6	9.35 536	55	9.36 681	57	10.63 319	9.98 855	54	
7	9.35 590	54	9.36 738	57	10.63 262	9.98 852	53	
8	9.35 644	54	9.36 795	57	10.63 205	9.98 849	52	
9	9.35 698	54	9.36 852	57	10.63 148	9.98 846	51	
10	9.35 752	54	9.36 909	57	10.63 091	9.98 843	**50**	
11	9.35 806	54	9.36 966	57	10.63 034	9.98 840	49	
12	9.35 860	54	9.37 023	57	10.62 977	9.98 837	48	
13	9.35 914	54	9.37 080	57	10.62 920	9.98 834	47	
14	9.35 968	54	9.37 137	57	10.62 863	9.98 831	46	
15	9.36 022	54	9.37 193	56	10.62 807	9.98 828	45	
16	9.36 075	53	9.37 250	57	10.62 750	9.98 825	44	
17	9.36 129	54	9.37 306	56	10.62 694	9.98 822	43	
18	9.36 182	53	9.37 363	57	10.62 637	9.98 819	42	
19	9.36 236	54	9.37 419	56	10.62 581	9.98 816	41	
20	9.36 289	53	9.37 476	57	10.62 524	9.98 813	**40**	
21	9.36 342	53	9.37 532	56	10.62 468	9.98 810	39	
22	9.36 395	53	9.37 588	56	10.62 412	9.98 807	38	
23	9.36 449	54	9.37 644	56	10.62 356	9.98 804	37	
24	9.36 502	53	9.37 700	56	10.62 300	9.98 801	36	
25	9.36 555	53	9.37 756	56	10.62 244	9.98 798	35	
26	9.36 608	53	9.37 812	56	10.62 188	9.98 795	34	
27	9.36 660	52	9.37 868	56	10.62 132	9.98 792	33	
28	9.36 713	53	9.37 924	56	10.62 076	9.98 789	32	
29	9.36 766	53	9.37 980	56	10.62 020	9.98 786	31	
30	9.36 819	53	9.38 035	55	10.61 965	9.98 783	**30**	
31	9.36 871	52	9.38 091	56	10.61 909	9.98 780	29	
32	9.36 924	53	9.38 147	56	10.61 853	9.98 777	28	
33	9.36 976	52	9.38 202	55	10.61 798	9.98 774	27	
34	9.37 028	52	9.38 257	55	10.61 743	9.98 771	26	
35	9.37 081	53	9.38 313	56	10.61 687	9.98 768	25	
36	9.37 133	52	9.38 368	55	10.61 632	9.98 765	24	
37	9.37 185	52	9.38 423	55	10.61 577	9.98 762	23	
38	9.37 237	52	9.38 479	56	10.61 521	9.98 759	22	
39	9.37 289	52	9.38 534	55	10.61 466	9.98 756	21	
40	9.37 341	52	9.38 589	55	10.61 411	9.98 753	**20**	
41	9.37 393	52	9.38 644	55	10.61 356	9.98 750	19	
42	9.37 445	52	9.38 699	55	10.61 301	9.98 746	18	
43	9.37 497	52	9.38 754	55	10.61 246	9.98 743	17	
44	9.37 549	52	9.38 808	54	10.61 192	9.98 740	16	
45	9.37 600	51	9.38 863	55	10.61 137	9.98 737	15	
46	9.37 652	52	9.38 918	55	10.61 082	9.98 734	14	
47	9.37 703	51	9.38 972	54	10.61 028	9.98 731	13	
48	9.37 755	52	9.39 027	55	10.60 973	9.98 728	12	
49	9.37 806	51	9.39 082	55	10.60 918	9.98 725	11	
50	9.37 858	52	9.39 136	54	10.60 864	9.98 722	**10**	
51	9.37 909	51	9.39 190	54	10.60 810	9.98 719	9	
52	9.37 960	51	9.39 245	55	10.60 755	9.98 715	8	
53	9.38 011	51	9.39 299	54	10.60 701	9.98 712	7	
54	9.38 062	51	9.39 353	54	10.60 647	9.98 709	6	
55	9.38 113	51	9.39 407	54	10.60 593	9.98 706	5	
56	9.38 164	51	9.39 461	54	10.60 539	9.98 703	4	
57	9.38 215	51	9.39 515	54	10.60 485	9.98 700	3	
58	9.38 266	51	9.39 569	54	10.60 431	9.98 697	2	
59	9.38 317	51	9.39 623	54	10.60 377	9.98 694	1	
60	9.38 368	51	9.39 677	54	10.60 323	9.98 690	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	′	Prop. Pts.

″	58	57	56
6	5.8	5.7	5.6
7	6.8	6.6	6.5
8	7.7	7.6	7.5
9	8.7	8.6	8.4
10	9.7	9.5	9.3
20	19.3	19.0	18.7
30	29.0	28.5	28.0
40	38.7	38.0	37.3
50	48.3	47.5	46.7

″	55	54	53
6	5.5	5.4	5.3
7	6.4	6.3	6.2
8	7.3	7.2	7.1
9	8.2	8.1	8.0
10	9.2	9.0	8.8
20	18.3	18.0	17.7
30	27.5	27.0	26.5
40	36.7	36.0	35.3
50	45.8	45.0	44.2

″	52	51	4
6	5.2	5.1	0.4
7	6.1	6.0	0.5
8	6.9	6.8	0.5
9	7.8	7.6	0.6
10	8.7	8.5	0.7
20	17.3	17.0	1.3
30	26.0	25.5	2.0
40	34.7	34.0	2.7
50	43.3	42.5	3.3

″	3	2
6	0.3	0.2
7	0.4	0.2
8	0.4	0.3
9	0.4	0.3
10	0.5	0.3
20	1.0	0.7
30	1.5	1.0
40	2.0	1.3
50	2.5	1.7

76°

14°

′	L Sin	d	L Tan	c d	L Cot	L Cos		Prop. Pts.
0	9.38 368		9.39 677		10.60 323	9.98 690	**60**	
1	9.38 418	50	9.39 731	54	10.60 269	9.98 687	59	
2	9.38 469	51	9.39 785	54	10.60 215	9.98 684	58	
3	9.38 519	50	9.39 838	53	10.60 162	9.98 681	57	
4	9.38 570	51	9.39 892	54	10.60 108	9.98 678	56	
5	9.38 620	50	9.39 945	53	10.60 055	9.98 675	55	
6	9.38 670	50	9.39 999	54	10.60 001	9.98 671	54	
7	9.38 721	51	9.40 052	53	10.59 948	9.98 668	53	
8	9.38 771	50	9.40 106	54	10.59 894	9.98 665	52	
9	9.38 821	50	9.40 159	53	10.59 841	9.98 662	51	
10	9.38 871	50	9.40 212	53	10.59 788	9.98 659	**50**	
11	9.38 921	50	9.40 266	54	10.59 734	9.98 656	49	
12	9.38 971	50	9.40 319	53	10.59 681	9.98 652	48	
13	9.39 021	50	9.40 372	53	10.59 628	9.98 649	47	
14	9.39 071	50	9.40 425	53	10.59 575	9.98 646	46	
15	9.39 121	50	9.40 478	53	10.59 522	9.98 643	45	
16	9.39 170	49	9.40 531	53	10.59 469	9.98 640	44	
17	9.39 220	50	9.40 584	53	10.59 416	9.98 636	43	
18	9.39 270	50	9.40 636	52	10.59 364	9.98 633	42	
19	9.39 319	49	9.40 689	53	10.59 311	9.98 630	41	
20	9.39 369	50	9.40 742	53	10.59 258	9.98 627	**40**	
21	9.39 418	49	9.40 795	53	10.59 205	9.98 623	39	
22	9.39 467	49	9.40 847	52	10.59 153	9.98 620	38	
23	9.39 517	50	9.40 900	53	10.59 100	9.98 617	37	
24	9.39 566	49	9.40 952	52	10.59 048	9.98 614	36	
25	9.39 615	49	9.41 005	53	10.58 995	9.98 610	35	
26	9.39 664	49	9.41 057	52	10.58 943	9.98 607	34	
27	9.39 713	49	9.41 109	52	10.58 891	9.98 604	33	
28	9.39 762	49	9.41 161	52	10.58 839	9.98 601	32	
29	9.39 811	49	9.41 214	53	10.58 786	9.98 597	31	
30	9.39 860	49	9.41 266	52	10.58 734	9.98 594	**30**	
31	9.39 909	49	9.41 318	52	10.58 682	9.98 591	29	
32	9.39 958	49	9.41 370	52	10.58 630	9.98 588	28	
33	9.40 006	48	9.41 422	52	10.58 578	9.98 584	27	
34	9.40 055	49	9.41 474	52	10.58 526	9.98 581	26	
35	9.40 103	48	9.41 526	52	10.58 474	9.98 578	25	
36	9.40 152	49	9.41 578	52	10.58 422	9.98 574	24	
37	9.40 200	48	9.41 629	51	10.58 371	9.98 571	23	
38	9.40 249	49	9.41 681	52	10.58 319	9.98 568	22	
39	9.40 297	48	9.41 733	52	10.58 267	9.98 565	21	
40	9.40 346	49	9.41 784	51	10.58 216	9.98 561	**20**	
41	9.40 394	48	9.41 836	52	10.58 164	9.98 558	19	
42	9.40 442	48	9.41 887	51	10.58 113	9.98 555	18	
43	9.40 490	48	9.41 939	52	10.58 061	9.98 551	17	
44	9.40 538	48	9.41 990	51	10.58 010	9.98 548	16	
45	9.40 586	48	9.42 041	51	10.57 959	9.98 545	15	
46	9.40 634	48	9.42 093	52	10.57 907	9.98 541	14	
47	9.40 682	48	9.42 144	51	10.57 856	9.98 538	13	
48	9.40 730	48	9.42 195	51	10.57 805	9.98 535	12	
49	9.40 778	48	9.42 246	51	10.57 754	9.98 531	11	
50	9.40 825	47	9.42 297	51	10.57 703	9.98 528	**10**	
51	9.40 873	48	9.42 348	51	10.57 652	9.98 525	9	
52	9.40 921	48	9.42 399	51	10.57 601	9.98 521	8	
53	9.40 968	47	9.42 450	51	10.57 550	9.98 518	7	
54	9.41 016	48	9.42 501	51	10.57 499	9.98 515	6	
55	9.41 063	47	9.42 552	51	10.57 448	9.98 511	5	
56	9.41 111	48	9.42 603	51	10.57 397	9.98 508	4	
57	9.41 158	47	9.42 653	50	10.57 347	9.98 505	3	
58	9.41 205	47	9.42 704	51	10.57 296	9.98 501	2	
59	9.41 252	47	9.42 755	51	10.57 245	9.98 498	1	
60	9.41 300	48	9.42 805	50	10.57 195	9.98 494	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	′	Prop. Pts.

″	54	53	52
6	5.4	5.3	5.2
7	6.3	6.2	6.1
8	7.2	7.1	6.9
9	8.1	8.0	7.8
10	9.0	8.8	8.7
20	18.0	17.7	17.3
30	27.0	26.5	26.0
40	36.0	35.3	34.7
50	45.0	44.2	43.3

″	51	50	49
6	5.1	5.0	4.9
7	6.0	5.8	5.7
8	6.8	6.7	6.5
9	7.6	7.5	7.4
10	8.5	8.3	8.2
20	17.0	16.7	16.3
30	25.5	25.0	24.5
40	34.0	33.3	32.7
50	42.5	41.7	40.8

″	48	47
6	4.8	4.7
7	5.6	5.5
8	6.4	6.3
9	7.2	7.0
10	8.0	7.8
20	16.0	15.7
30	24.0	23.5
40	32.0	31.3
50	40.0	39.2

″	4	3
6	0.4	0.3
7	0.5	0.4
8	0.5	0.4
9	0.6	0.4
10	0.7	0.5
20	1.3	1.0
30	2.0	1.5
40	2.7	2.0
50	3.3	2.5

75°

15°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.41 300		9.42 805		10.57 195	9.98 494		**60**	
1	9.41 347	47	9.42 856	51	10.57 144	9.98 491	3	59	
2	9.41 394	47	9.42 906	50	10.57 094	9.98 488	3	58	
3	9.41 441	47	9.42 957	51	10.57 043	9.98 484	4	57	
4	9.41 488	47	9.43 007	50	10.56 993	9.98 481	3	56	
5	9.41 535	47	9.43 057	50	10.56 943	9.98 477	4	55	
6	9.41 582	47	9.43 108	51	10.56 892	9.98 474	3	54	
7	9.41 628	46	9.43 158	50	10.56 842	9.98 471	3	53	
8	9.41 675	47	9.43 208	50	10.56 792	9.98 467	4	52	
9	9.41 722	47	9.43 258	50	10.56 742	9.98 464	3	51	
10	9.41 768	46	9.43 308	50	10.56 692	9.98 460	4	**50**	
11	9.41 815	47	9.43 358	50	10.56 642	9.98 457	3	49	
12	9.41 861	46	9.43 408	50	10.56 592	9.98 453	4	48	
13	9.41 908	47	9.43 458	50	10.56 542	9.98 450	3	47	
14	9.41 954	46	9.43 508	50	10.56 492	9.98 447	3	46	
15	9.42 001	47	9.43 558	50	10.56 442	9.98 443	4	45	
16	9.42 047	46	9.43 607	49	10.56 393	9.98 440	3	44	
17	9.42 093	46	9.43 657	50	10.56 343	9.98 436	4	43	
18	9.42 140	47	9.43 707	50	10.56 293	9.98 433	3	42	
19	9.42 186	46	9.43 756	49	10.56 244	9.98 429	4	41	
20	9.42 232	46	9.43 806	50	10.56 194	9.98 426	3	**40**	
21	9.42 278	46	9.43 855	49	10.56 145	9.98 422	4	39	
22	9.42 324	46	9.43 905	50	10.56 095	9.98 419	3	38	
23	9.42 370	46	9.43 954	49	10.56 046	9.98 415	4	37	
24	9.42 416	46	9.44 004	50	10.55 996	9.98 412	3	36	
25	9.42 461	45	9.44 053	49	10.55 947	9.98 409	3	35	
26	9.42 507	46	9.44 102	49	10.55 898	9.98 405	4	34	
27	9.42 553	46	9.44 151	49	10.55 849	9.98 402	3	33	
28	9.42 599	46	9.44 201	50	10.55 799	9.98 398	4	32	
29	9.42 644	45	9.44 250	49	10.55 750	9.98 395	3	31	
30	9.42 690	46	9.44 299	49	10.55 701	9.98 391	4	**30**	
31	9.42 735	45	9.44 348	49	10.55 652	9.98 388	3	29	
32	9.42 781	46	9.44 397	49	10.55 603	9.98 384	4	28	
33	9.42 826	45	9.44 446	49	10.55 554	9.98 381	3	27	
34	9.42 872	46	9.44 495	49	10.55 505	9.98 377	4	26	
35	9.42 917	45	9.44 544	49	10.55 456	9.98 373	4	25	
36	9.42 962	45	9.44 592	48	10.55 408	9.98 370	3	24	
37	9.43 008	46	9.44 641	49	10.55 359	9.98 366	4	23	
38	9.43 053	45	9.44 690	49	10.55 310	9.98 363	3	22	
39	9.43 098	45	9.44 738	48	10.55 262	9.98 359	4	21	
40	9.43 143	45	9.44 787	49	10.55 213	9.98 356	3	**20**	
41	9.43 188	45	9.44 836	49	10.55 164	9.98 352	4	19	
42	9.43 233	45	9.44 884	48	10.55 116	9.98 349	3	18	
43	9.43 278	45	9.44 933	49	10.55 067	9.98 345	4	17	
44	9.43 323	45	9.44 981	48	10.55 019	9.98 342	3	16	
45	9.43 367	44	9.45 029	48	10.54 971	9.98 338	4	15	
46	9.43 412	45	9.45 078	49	10.54 922	9.98 334	4	14	
47	9.43 457	45	9.45 126	48	10.54 874	9.98 331	3	13	
48	9.43 502	45	9.45 174	48	10.54 826	9.98 327	4	12	
49	9.43 546	44	9.45 222	48	10.54 778	9.98 324	3	11	
50	9.43 591	45	9.45 271	49	10.54 729	9.98 320	4	**10**	
51	9.43 635	44	9.45 319	48	10.54 681	9.98 317	3	9	
52	9.43 680	45	9.45 367	48	10.54 633	9.98 313	4	8	
53	9.43 724	44	9.45 415	48	10.54 585	9.98 309	4	7	
54	9.43 769	45	9.45 463	48	10.54 537	9.98 306	3	6	
55	9.43 813	44	9.45 511	48	10.54 489	9.98 302	4	5	
56	9.43 857	44	9.45 559	48	10.54 441	9.98 299	3	4	
57	9.43 901	44	9.45 606	47	10.54 394	9.98 295	4	3	
58	9.43 946	45	9.45 654	48	10.54 346	9.98 291	4	2	
59	9.43 990	44	9.45 702	48	10.54 298	9.98 288	3	1	
60	9.44 034	44	9.45 750	48	10.54 250	9.98 284	4	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	51	50	49
6	5.1	5.0	4.9
7	6.0	5.8	5.7
8	6.8	6.7	6.5
9	7.7	7.5	7.4
10	8.5	8.3	8.2
20	17.0	16.7	16.3
30	25.5	25.0	24.5
40	34.0	33.3	32.7
50	42.5	41.7	40.8

″	48	47	46
6	4.8	4.7	4.6
7	5.6	5.5	5.4
8	6.4	6.3	6.1
9	7.2	7.0	6.9
10	8.0	7.8	7.7
20	16.0	15.7	15.3
30	24.0	23.5	23.0
40	32.0	31.3	30.7
50	40.0	39.2	38.3

″	45	44
6	4.5	4.4
7	5.3	5.1
8	6.0	5.9
9	6.8	6.6
10	7.5	7.3
20	15.0	14.7
30	22.5	22.0
40	30.0	29.3
50	37.5	36.7

″	4	3
6	0.4	0.3
7	0.5	0.4
8	0.5	0.4
9	0.6	0.5
10	0.7	0.5
20	1.3	1.0
30	2.0	1.5
40	2.7	2.0
50	3.3	2.5

74°

16°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.44 034		9.45 750		10.54 250	9.98 284		**60**	
1	9.44 078	44	9.45 797	47	10.54 203	9.98 281	3	59	
2	9.44 122	44	9.45 845	48	10.54 155	9.98 277	4	58	
3	9.44 166	44	9.45 892	47	10.54 108	9.98 273	4	57	
4	9.44 210	44	9.45 940	48	10.54 060	9.98 270	3	56	
5	9.44 253	43	9.45 987	47	10.54 013	9.98 266	4	55	
6	9.44 297	44	9.46 035	48	10.53 965	9.98 262	4	54	
7	9.44 341	44	9.46 082	47	10.53 918	9.98 259	3	53	
8	9.44 385	44	9.46 130	48	10.53 870	9.98 255	4	52	
9	9.44 428	43	9.46 177	47	10.53 823	9.98 251	4	51	
10	9.44 472	44	9.46 224	47	10.53 776	9.98 248	3	**50**	
11	9.44 516	44	9.46 271	47	10.53 729	9.98 244	4	49	
12	9.44 559	43	9.46 319	48	10.53 681	9.98 240	4	48	
13	9.44 602	43	9.46 366	47	10.53 634	9.98 237	3	47	
14	9.44 646	44	9.46 413	47	10.53 587	9.98 233	4	46	
15	9.44 689	43	9.46 460	47	10.53 540	9.98 229	4	45	
16	9.44 733	44	9.46 507	47	10.53 493	9.98 226	3	44	
17	9.44 776	43	9.46 554	47	10.53 446	9.98 222	4	43	
18	9.44 819	43	9.46 601	47	10.53 399	9.98 218	4	42	
19	9.44 862	43	9.46 648	47	10.53 352	9.98 215	3	41	
20	9.44 905	43	9.46 694	46	10.53 306	9.98 211	4	**40**	
21	9.44 948	43	9.46 741	47	10.53 259	9.98 207	4	39	
22	9.44 992	44	9.46 788	47	10.53 212	9.98 204	3	38	
23	9.45 035	43	9.46 835	47	10.53 165	9.98 200	4	37	
24	9.45 077	42	9.46 881	46	10.53 119	9.98 196	4	36	
25	9.45 120	43	9.46 928	47	10.53 072	9.98 192	4	35	
26	9.45 163	43	9.46 975	47	10.53 025	9.98 189	3	34	
27	9.45 206	43	9.47 021	46	10.52 979	9.98 185	4	33	
28	9.45 249	43	9.47 068	47	10.52 932	9.98 181	4	32	
29	9.45 292	43	9.47 114	46	10.52 886	9.98 177	4	31	
30	9.45 344	42	9.47 160	46	10.52 840	9.98 174	3	**30**	
31	9.45 377	43	9.47 207	47	10.52 793	9.98 170	4	29	
32	9.45 419	42	9.47 253	46	10.52 747	9.98 166	4	28	
33	9.45 462	43	9.47 299	46	10.52 701	9.98 162	4	27	
34	9.45 504	42	9.47 346	47	10.52 654	9.98 159	3	26	
35	9.45 547	43	9.47 392	46	10.52 608	9.98 155	4	25	
36	9.45 589	42	9.47 438	46	10.52 562	9.98 151	4	24	
37	9.45 632	43	9.47 484	46	10.52 516	9.98 147	4	23	
38	9.45 674	42	9.47 530	46	10.52 470	9.98 144	3	22	
39	9.45 716	42	9.47 576	46	10.52 424	9.98 140	4	21	
40	9.45 758	42	9.47 622	46	10.52 378	9.98 136	4	**20**	
41	9.45 801	43	9.47 668	46	10.52 332	9.98 132	4	19	
42	9.45 843	42	9.47 714	46	10.52 286	9.98 129	3	18	
43	9.45 885	42	9.47 760	46	10.52 240	9.98 125	4	17	
44	9.45 927	42	9.47 806	46	10.52 194	9.98 121	4	16	
45	9.45 969	42	9.47 852	46	10.52 148	9.98 117	4	15	
46	9.46 011	42	9.47 897	45	10.52 103	9.98 113	4	14	
47	9.46 053	42	9.47 943	46	10.52 057	9.98 110	3	13	
48	9.46 095	42	9.47 989	46	10.52 011	9.98 106	4	12	
49	9.46 136	41	9.48 035	46	10.51 965	9.98 102	4	11	
50	9.46 178	42	9.48 080	45	10.51 920	9.98 098	4	**10**	
51	9.46 220	42	9.48 126	46	10.51 874	9.98 094	4	9	
52	9.46 262	42	9.48 171	45	10.51 829	9.98 090	4	8	
53	9.46 303	41	9.48 217	46	10.51 783	9.98 087	3	7	
54	9.46 345	42	9.48 262	45	10.51 738	9.98 083	4	6	
55	9.46 386	41	9.48 307	45	10.51 693	9.98 079	4	5	
56	9.46 428	42	9.48 353	46	10.51 647	9.98 075	4	4	
57	9.46 469	41	9.48 398	45	10.51 602	9.98 071	4	3	
58	9.46 511	42	9.48 443	45	10.51 557	9.98 067	4	2	
59	9.46 552	41	9.48 489	46	10.51 511	9.98 063	4	1	
60	9.46 594	42	9.48 534	45	10.51 466	9.98 060	3	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	48	47	46
6	4.8	4.7	4.6
7	5.6	5.5	5.4
8	6.4	6.3	6.1
9	7.2	7.0	6.9
10	8.0	7.8	7.7
20	16.0	15.7	15.3
30	24.0	23.5	23.0
40	32.0	31.3	30.7
50	40.0	39.2	38.3

″	45	44	43
6	4.5	4.4	4.3
7	5.3	5.1	5.0
8	6.0	5.9	5.7
9	6.8	6.6	6.4
10	7.5	7.3	7.2
20	15.0	14.7	14.3
30	22.5	22.0	21.5
40	30.0	29.3	28.7
50	37.5	36.7	35.8

″	42	41
6	4.2	4.1
7	4.9	4.8
8	5.6	5.5
9	6.3	6.2
10	7.0	6.8
20	14.0	13.7
30	21.0	20.5
40	28.0	27.3
50	35.0	34.2

″	4	3
6	0.4	0.3
7	0.5	0.4
8	0.5	0.4
9	0.6	0.5
10	0.7	0.5
20	1.3	1.0
30	2.0	1.5
40	2.7	2.0
50	3.3	2.5

73°

17°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.46 594		9.48 534		10.51 466	9.98 060		**60**	
1	9.46 635	41	9.48 579	45	10.51 421	9.98 056	4	59	
2	9.46 676	41	9.48 624	45	10.51 376	9.98 052	4	58	
3	9.46 717	41	9.48 669	45	10.51 331	9.98 048	4	57	
4	9.46 758	41	9.48 714	45	10.51 286	9.98 044	4	56	
5	9.46 800	42	9.48 759	45	10.51 241	9.98 040	4	55	
6	9.46 841	41	9.48 804	45	10.51 196	9.98 036	4	54	
7	9.46 882	41	9.48 849	45	10.51 151	9.98 032	4	53	
8	9.46 923	41	9.48 894	45	10.51 106	9.98 029	3	52	
9	9.46 964	41	9.48 939	45	10.51 061	9.98 025	4	51	
10	9.47 005	41	9.48 984	45	10.51 016	9.98 021	4	**50**	
11	9.47 045	40	9.49 029	44	10.50 971	9.98 017	4	49	
12	9.47 086	41	9.49 073	45	10.50 927	9.98 013	4	48	
13	9.47 127	41	9.49 118	45	10.50 882	9.98 009	4	47	
14	9.47 168	41	9.49 163	44	10.50 837	9.98 005	4	46	
15	9.47 209	41	9.49 207	45	10.50 793	9.98 001	4	45	
16	9.47 249	40	9.49 252	44	10.50 748	9.97 997	4	44	
17	9.47 290	41	9.49 296	45	10.50 704	9.97 993	4	43	
18	9.47 330	40	9.49 341	44	10.50 659	9.97 989	4	42	
19	9.47 371	41	9.49 385	45	10.50 615	9.97 986	3	41	
20	9.47 411	40	9.49 430	44	10.50 570	9.97 982	4	**40**	
21	9.47 452	41	9.49 474	45	10.50 526	9.97 978	4	39	
22	9.47 492	40	9.49 519	44	10.50 481	9.97 974	4	38	
23	9.47 533	41	9.49 563	44	10.50 437	9.97 970	4	37	
24	9.47 573	40	9.49 607	44	10.50 393	9.97 966	4	36	
25	9.47 613	40	9.49 652	45	10.50 348	9.97 962	4	35	
26	9.47 654	41	9.49 696	44	10.50 304	9.97 958	4	34	
27	9.47 694	40	9.49 740	44	10.50 260	9.97 954	4	33	
28	9.47 734	40	9.49 784	44	10.50 216	9.97 950	4	32	
29	9.47 774	40	9.49 828	44	10.50 172	9.97 946	4	31	
30	9.47 814	40	9.49 872	44	10.50 128	9.97 942	4	**30**	
31	9.47 854	40	9.49 916	44	10.50 084	9.97 938	4	29	
32	9.47 894	40	9.49 960	44	10.50 040	9.97 934	4	28	
33	9.47 934	40	9.50 004	44	10.49 996	9.97 930	4	27	
34	9.47 974	40	9.50 048	44	10.49 952	9.97 926	4	26	
35	9.48 014	40	9.50 092	44	10.49 908	9.97 922	4	25	
36	9.48 054	40	9.50 136	44	10.49 864	9.97 918	4	24	
37	9.48 094	40	9.50 180	44	10.49 820	9.97 914	4	23	
38	9.48 133	39	9.50 223	43	10.49 777	9.97 910	4	22	
39	9.48 173	40	9.50 267	44	10.49 733	9.97 906	4	21	
40	9.48 213	40	9.50 311	44	10.49 689	9.97 902	4	**20**	
41	9.48 252	39	9.50 355	44	10.49 645	9.97 898	4	19	
42	9.48 292	40	9.50 398	43	10.49 602	9.97 894	4	18	
43	9.48 332	40	9.50 442	44	10.49 558	9.97 890	4	17	
44	9.48 371	39	9.50 485	43	10.49 515	9.97 886	4	16	
45	9.48 411	40	9.50 529	44	10.49 471	9.97 882	4	15	
46	9.48 450	39	9.50 572	43	10.49 428	9.97 878	4	14	
47	9.48 490	40	9.50 616	44	10.49 384	9.97 874	4	13	
48	9.48 529	39	9.50 659	43	10.49 341	9.97 870	4	12	
49	9.48 568	39	9.50 703	44	10.49 297	9.97 866	4	11	
50	9.48 607	39	9.50 746	43	10.49 254	9.97 861	5	**10**	
51	9.48 647	40	9.50 789	43	10.49 211	9.97 857	4	9	
52	9.48 686	39	9.50 833	44	10.49 167	9.97 853	4	8	
53	9.48 725	39	9.50 876	43	10.49 124	9.97 849	4	7	
54	9.48 764	39	9.50 919	43	10.49 081	9.97 845	4	6	
55	9.48 803	39	9.50 962	43	10.49 038	9.97 841	4	5	
56	9.48 842	39	9.51 005	43	10.48 995	9.97 837	4	4	
57	9.48 881	39	9.51 048	43	10.48 952	9.97 833	4	3	
58	9.48 920	39	9.51 092	44	10.48 908	9.97 829	4	2	
59	9.48 959	39	9.51 135	43	10.48 865	9.97 825	4	1	
60	9.48 998	39	9.51 178	43	10.48 822	9.97 821	4	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	45	44	43
6	4.5	4.4	4.3
7	5.3	5.1	5.0
8	6.0	5.9	5.7
9	6.8	6.6	6.4
10	7.5	7.3	7.2
20	15.0	14.7	14.3
30	22.5	22.0	21.5
40	30.0	29.3	28.7
50	37.5	36.7	35.8

″	42	41
6	4.2	4.1
7	4.9	4.8
8	5.6	5.5
9	6.3	6.2
10	7.0	6.8
20	14.0	13.7
30	21.0	20.5
40	28.0	27.3
50	35.0	34.2

″	40	39
6	4.0	3.9
7	4.7	4.6
8	5.3	5.2
9	6.0	5.9
10	6.7	6.5
20	13.3	13.0
30	20.0	19.5
40	26.7	26.0
50	33.3	32.5

″	5	4	3
6	0.5	0.4	0.3
7	0.6	0.5	0.4
8	0.7	0.5	0.4
9	0.8	0.6	0.5
10	0.8	0.7	0.5
20	1.7	1.3	1.0
30	2.5	2.0	1.5
40	3.3	2.7	2.0
50	4.2	3.3	2.5

72°

18°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.48 998		9.51 178		10.48 822	9.97 821		**60**	
1	9.49 037	39	9.51 221	43	10.48 779	9.97 817	4	59	
2	9.49 076	39	9.51 264	43	10.48 736	9.97 812	5	58	
3	9.49 115	39	9.51 306	42	10.48 694	9.97 808	4	57	
4	9.49 153	38	9.51 349	43	10.48 651	9.97 804	4	56	
5	9.49 192	39	9.51 392	43	10.48 608	9.97 800	4	55	
6	9.49 231	39	9.51 435	43	10.48 565	9.97 796	4	54	
7	9.49 269	38	9.51 478	43	10.48 522	9.97 792	4	53	
8	9.49 308	39	9.51 520	42	10.48 480	9.97 788	4	52	
9	9.49 347	39	9.51 563	43	10.48 437	9.97 784	4	51	
10	9.49 385	38	9.51 606	43	10.48 394	9.97 779	5	**50**	
11	9.49 424	39	9.51 648	42	10.48 352	9.97 775	4	49	
12	9.49 462	38	9.51 691	43	10.48 309	9.97 771	4	48	
13	9.49 500	38	9.51 734	43	10.48 266	9.97 767	4	47	
14	9.49 539	39	9.51 776	42	10.48 224	9.97 763	4	46	
15	9.49 577	38	9.51 819	43	10.48 181	9.97 759	4	45	
16	9.49 615	38	9.51 861	42	10.48 139	9.97 754	5	44	
17	9.49 654	39	9.51 903	42	10.48 097	9.97 750	4	43	
18	9.49 692	38	9.51 946	43	10.48 054	9.97 746	4	42	
19	9.49 730	38	9.51 988	42	10.48 012	9.97 742	4	41	
20	9.49 768	38	9.52 031	43	10.47 969	9.97 738	4	**40**	
21	9.49 806	38	9.52 073	42	10.47 927	9.97 734	4	39	
22	9.49 844	38	9.52 115	42	10.47 885	9.97 729	5	38	
23	9.49 882	38	9.52 157	42	10.47 843	9.97 725	4	37	
24	9.49 920	38	9.52 200	43	10.47 800	9.97 721	4	36	
25	9.49 958	38	9.52 242	42	10.47 758	9.97 717	4	35	
26	9.49 996	38	9.52 284	42	10.47 716	9.97 713	4	34	
27	9.50 034	38	9.52 326	42	10.47 674	9.97 708	5	33	
28	9.50 072	38	9.52 368	42	10.47 632	9.97 704	4	32	
29	9.50 110	38	9.52 410	42	10.47 590	9.97 700	4	31	
30	9.50 148	37	9.52 452	42	10.47 548	9.97 696	4	**30**	
31	9.50 185	38	9.52 494	42	10.47 506	9.97 691	5	29	
32	9.50 223	38	9.52 536	42	10.47 464	9.97 687	4	28	
33	9.50 261	37	9.52 578	42	10.47 422	9.97 683	4	27	
34	9.50 298	38	9.52 620	42	10.47 380	9.97 679	4	26	
35	9.50 336	38	9.52 661	41	10.47 339	9.97 674	5	25	
36	9.50 374	37	9.52 703	42	10.47 297	9.97 670	4	24	
37	9.50 411	38	9.52 745	42	10.47 255	9.97 666	4	23	
38	9.50 449	37	9.52 787	42	10.47 213	9.97 662	4	22	
39	9.50 486	37	9.52 829	42	10.47 171	9.97 657	5	21	
40	9.50 523	38	9.52 870	41	10.47 130	9.97 653	4	**20**	
41	9.50 561	37	9.52 912	42	10.47 088	9.97 649	4	19	
42	9.50 598	37	9.52 953	41	10.47 047	9.97 645	4	18	
43	9.50 635	38	9.52 995	42	10.47 005	9.97 640	5	17	
44	9.50 673	37	9.53 037	42	10.46 963	9.97 636	4	16	
45	9.50 710	37	9.53 078	41	10.46 922	9.97 632	4	15	
46	9.50 747	37	9.53 120	42	10.46 880	9.97 628	4	14	
47	9.50 784	37	9.53 161	41	10.46 839	9.97 623	5	13	
48	9.50 821	37	9.53 202	41	10.46 798	9.97 619	4	12	
49	9.50 858	37	9.53 244	42	10.46 756	9.97 615	4	11	
50	9.50 896	38	9.53 285	41	10.46 715	9.97 610	5	**10**	
51	9.50 933	37	9.53 327	42	10.46 673	9.97 606	4	9	
52	9.50 970	37	9.53 368	41	10.46 632	9.97 602	4	8	
53	9.51 007	37	9.53 409	41	10.46 591	9.97 597	5	7	
54	9.51 043	36	9.53 450	41	10.46 550	9.97 593	4	6	
55	9.51 080	37	9.53 492	42	10.46 508	9.97 589	4	5	
56	9.51 117	37	9.53 533	41	10.46 467	9.97 584	5	4	
57	9.51 154	37	9.53 574	41	10.46 426	9.97 580	4	3	
58	9.51 191	37	9.53 615	41	10.46 385	9.97 576	4	2	
59	9.51 227	36	9.53 656	41	10.46 344	9.97 571	5	1	
60	9.51 264	37	9.53 697	41	10.46 303	9.97 567	4	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	43	42	41
6	4.3	4.2	4.1
7	5.0	4.9	4.8
8	5.7	5.6	5.5
9	6.4	6.3	6.2
10	7.2	7.0	6.8
20	14.3	14.0	13.7
30	21.5	21.0	20.5
40	28.7	28.0	27.3
50	35.8	35.0	34.2

″	39	38	37
6	3.9	3.8	3.7
7	4.6	4.4	4.3
8	5.2	5.1	4.9
9	5.9	5.7	5.6
10	6.5	6.3	6.2
20	13.0	12.7	12.3
30	19.5	19.0	18.5
40	26.0	25.3	24.7
50	32.5	31.7	30.8

″	36	5	4
6	3.6	0.5	0.4
7	4.2	0.6	0.5
8	4.8	0.7	0.5
9	5.4	0.8	0.6
10	6.0	0.8	0.7
20	12.0	1.7	1.3
30	18.0	2.5	2.0
40	24.0	3.3	2.7
50	30.0	4.2	3.3

71°

19°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.51 264		9.53 697		10.46 303	9.97 567		**60**	
1	9.51 301	37	9.53 738	41	10.46 262	9.97 563	4	59	
2	9.51 338	37	9.53 779	41	10.46 221	9.97 558	5	58	
3	9.51 374	36	9.53 820	41	10.46 180	9.97 554	4	57	
4	9.51 411	37	9.53 861	41	10.46 139	9.97 550	4	56	
5	9.51 447	36	9.53 902	41	10.46 098	9.97 545	5	55	
6	9.51 484	37	9.53 943	41	10.46 057	9.97 541	4	54	
7	9.51 520	36	9.53 984	41	10.46 016	9.97 536	5	53	
8	9.51 557	37	9.54 025	41	10.45 975	9.97 532	4	52	
9	9.51 593	36	9.54 065	40	10.45 935	9.97 528	4	51	
10	9.51 629	36	9.54 106	41	10.45 894	9.97 523	5	**50**	
11	9.51 666	37	9.54 147	41	10.45 853	9.97 519	4	49	
12	9.51 702	36	9.54 187	40	10.45 813	9.97 515	4	48	
13	9.51 738	36	9.54 228	41	10.45 772	9.97 510	5	47	
14	9.51 774	36	9.54 269	41	10.45 731	9.97 506	4	46	
15	9.51 811	37	9.54 309	40	10.45 691	9.97 501	5	45	
16	9.51 847	36	9.54 350	41	10.45 650	9.97 497	4	44	
17	9.51 883	36	9.54 390	40	10.45 610	9.97 492	5	43	
18	9.51 919	36	9.54 431	41	10.45 569	9.97 488	4	42	
19	9.51 955	36	9.54 471	40	10.45 529	9.97 484	4	41	
20	9.51 991	36	9.54 512	41	10.45 488	9.97 479	5	**40**	
21	9.52 027	36	9.54 552	40	10.45 448	9.97 475	4	39	
22	9.52 063	36	9.54 593	41	10.45 407	9.97 470	5	38	
23	9.52 099	36	9.54 633	40	10.45 367	9.97 466	4	37	
24	9.52 135	36	9.54 673	40	10.45 327	9.97 461	5	36	
25	9.52 171	36	9.54 714	41	10.45 286	9.97 457	4	35	
26	9.52 207	36	9.54 754	40	10.45 246	9.97 453	4	34	
27	9.52 242	35	9.54 794	40	10.45 206	9.97 448	5	33	
28	9.52 278	36	9.54 835	41	10.45 165	9.97 444	4	32	
29	9.52 314	36	9.54 875	40	10.45 125	9.97 439	5	31	
30	9.52 350	36	9.54 915	40	10.45 085	9.97 435	4	**30**	
31	9.52 385	35	9.54 955	40	10.45 045	9.97 430	5	29	
32	9.52 421	36	9.54 995	40	10.45 005	9.97 426	4	28	
33	9.52 456	35	9.55 035	40	10.44 965	9.97 421	5	27	
34	9.52 492	36	9.55 075	40	10.44 925	9.97 417	4	26	
35	9.52 527	35	9.55 115	40	10.44 885	9.97 412	5	25	
36	9.52 563	36	9.55 155	40	10.44 845	9.97 408	4	24	
37	9.52 598	35	9.55 195	40	10.44 805	9.97 403	5	23	
38	9.52 634	36	9.55 235	40	10.44 765	9.97 399	4	22	
39	9.52 669	35	9.55 275	40	10.44 725	9.97 394	5	21	
40	9.52 705	36	9.55 315	40	10.44 685	9.97 390	4	**20**	
41	9.52 740	35	9.55 355	40	10.44 645	9.97 385	5	19	
42	9.52 775	35	9.55 395	40	10.44 605	9.97 381	4	18	
43	9.52 811	36	9.55 434	39	10.44 566	9.97 376	5	17	
44	9.52 846	35	9.55 474	40	10.44 526	9.97 372	4	16	
45	9.52 881	35	9.55 514	40	10.44 486	9.97 367	5	15	
46	9.52 916	35	9.55 554	40	10.44 446	9.97 363	4	14	
47	9.52 951	35	9.55 593	39	10.44 407	9.97 358	5	13	
48	9.52 986	35	9.55 633	40	10.44 367	9.97 353	5	12	
49	9.53 021	35	9.55 673	40	10.44 327	9.97 349	4	11	
50	9.53 056	35	9.55 712	39	10.44 288	9.97 344	5	**10**	
51	9.53 092	36	9.55 752	40	10.44 248	9.97 340	4	9	
52	9.53 126	34	9.55 791	39	10.44 209	9.97 335	5	8	
53	9.53 161	35	9.55 831	40	10.44 169	9.97 331	4	7	
54	9.53 196	35	9.55 870	39	10.44 130	9.97 326	5	6	
55	9.53 231	35	9.55 910	40	10.44 090	9.97 322	4	5	
56	9.53 266	35	9.55 949	39	10.44 051	9.97 317	5	4	
57	9.53 301	35	9.55 989	40	10.44 011	9.97 312	5	3	
58	9.53 336	35	9.56 028	39	10.43 972	9.97 308	4	2	
59	9.53 370	34	9.56 067	39	10.43 933	9.97 303	5	1	
60	9.53 405	35	9.56 107	40	10.43 893	9.97 299	4		
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	41	40	39
6	4.1	4.0	3.9
7	4.8	4.7	4.6
8	5.5	5.3	5.2
9	6.2	6.0	5.9
10	6.8	6.7	6.5
20	13.7	13.3	13.0
30	20.5	20.0	19.5
40	27.3	26.7	26.0
50	34.2	33.3	32.5

″	37	36	35
6	3.7	3.6	3.5
7	4.3	4.2	4.1
8	4.9	4.8	4.7
9	5.6	5.4	5.3
10	6.2	6.0	5.8
20	12.3	12.0	11.7
30	18.5	18.0	17.5
40	24.7	24.0	23.3
50	30.8	30.0	29.2

″	34	5	4
6	3.4	0.5	0.4
7	4.0	0.6	0.5
8	4.5	0.7	0.5
9	5.1	0.8	0.6
10	5.7	0.8	0.7
20	11.3	1.7	1.3
30	17.0	2.5	2.0
40	22.7	3.3	2.7
50	28.3	4.2	3.3

70°

20°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.53 405		9.56 107		10.43 893	9.97 299		**60**	
1	9.53 440	35	9.56 146	39	10.43 854	9.97 294	5	59	
2	9.53 475	35	9.56 185	39	10.43 815	9.97 289	5	58	
3	9.53 509	34	9.56 224	39	10.43 776	9.97 285	4	57	
4	9.53 544	35	9.56 264	40	10.43 736	9.97 280	5	56	
5	9.53 578	34	9.56 303	39	10.43 697	9.97 276	4	55	″ | **40** | **39**
6	9.53 613	35	9.56 342	39	10.43 658	9.97 271	5	54	6 | 4.0 | 3.9
7	9.53 647	34	9.56 381	39	10.43 619	9.97 266	5	53	7 | 4.7 | 4.6
8	9.53 682	35	9.56 420	39	10.43 580	9.97 262	4	52	8 | 5.3 | 5.2
9	9.53 716	34	9.56 459	39	10.43 541	9.97 257	5	51	9 | 6.0 | 5.9
10	9.53 751	35	9.56 498	39	10.43 502	9.97 252	5	**50**	10 | 6.7 | 6.5
11	9.53 785	34	9.56 537	39	10.43 463	9.97 248	4	49	20 | 13.3 | 13.0
12	9.53 819	34	9.56 576	39	10.43 424	9.97 243	5	48	30 | 20.0 | 19.5
13	9.53 854	35	9.56 615	39	10.43 385	9.97 238	5	47	40 | 26.7 | 26.0
14	9.53 888	34	9.56 654	39	10.43 346	9 97 234	4	46	50 | 33.3 | 32.5
15	9.53 922	34	9.56 693	39	10.43 307	9.97 229	5	45	
16	9.53 957	35	9.56 732	39	10.43 268	9.97 224	5	44	
17	9.53 991	34	9.56 771	39	10.43 229	9.97 220	4	43	
18	9.54 025	34	9.56 810	39	10.43 190	9.97 215	5	42	
19	9.54 059	34	9.56 849	39	10.43 151	9.97 210	5	41	″ | **38** | **37**
20	9.54 093	34	9.56 887	38	10.43 113	9.97 206	4	**40**	
21	9.54 127	34	9.56 926	39	10.43 074	9.97 201	5	39	6 | 3.8 | 3.7
22	9.54 161	34	9.56 965	39	10.43 035	9.97 196	5	38	7 | 4.4 | 4.3
23	9.54 195	34	9.57 004	39	10.42 996	9.97 192	4	37	8 | 5.1 | 4.9
24	9.54 229	34	9.57 042	38	10.42 958	9.97 187	5	36	9 | 5.7 | 5.6
25	9.54 263	34	9.57 081	39	10.42 919	9.97 182	5	35	10 | 6.3 | 6.2
26	9.54 297	34	9.57 120	39	10.42 880	9.97 178	4	34	20 | 12.7 | 12.3
27	9.54 331	34	9.57 158	38	10.42 842	9.97 173	5	33	30 | 19.0 | 18.5
28	9.54 365	34	9.57 197	39	10.42 803	9.97 168	5	32	40 | 25.3 | 24.7
29	9.54 399	34	9.57 235	38	10.42 765	9.97 163	5	31	50 | 31.7 | 30.8
30	9.54 433	34	9.57 274	39	10.42 726	9.97 159	4	**30**	
31	9.54 466	33	9.57 312	38	10.42 688	9.97 154	5	29	
32	9.54 500	34	9.57 351	39	10.42 649	9.97 149	5	28	
33	9.54 534	34	9.57 389	38	10.42 611	9.97 145	4	27	″ | **35** | **34**
34	9.54 567	33	9.57 428	39	10.42 572	9.97 140	5	26	
35	9.54 601	34	9.57 466	38	10.42 534	9.97 135	5	25	6 | 3.5 | 3.4
36	9.54 635	34	9.57 504	38	10.42 496	9.97 130	5	24	7 | 4.1 | 4.0
37	9.54 668	33	9.57 543	39	10.42 457	9.97 126	4	23	8 | 4.7 | 4.5
38	9.54 702	34	9.57 581	38	10.42 419	9.97 121	5	22	9 | 5.3 | 5.1
39	9.54 735	33	9.57 619	38	10.42 381	9.97 116	5	21	10 | 5.8 | 5.7
40	9.54 769	34	9.57 658	39	10.42 342	9.97 111	5	**20**	20 | 11.7 | 11.3
41	9.54 802	33	9.57 696	38	10.42 304	9.97 107	4	19	30 | 17.5 | 17.0
42	9.54 836	34	9.57 734	38	10.42 266	9.97 102	5	18	40 | 23.3 | 22.7
43	9.54 869	33	9.57 772	38	10.42 228	9.97 097	5	17	50 | 29.2 | 28.3
44	9.54 903	34	9.57 810	38	10.42 190	9.97 092	5	16	
45	9.54 936	33	9.57 849	39	10.42 151	9.97 087	5	15	
46	9.54 969	33	9.57 887	38	10.42 113	9.97 083	4	14	
47	9.55 003	34	9.57 925	38	10.42 075	9.97 078	5	13	″ | **33** | **5** | **4**
48	9.55 036	33	9.57 963	38	10.42 037	9.97 073	5	12	
49	9.55 069	33	9.58 001	38	10.41 999	9.97 068	5	11	6 | 3.3 | 0.5 | 0.4
50	9.55 102	33	9.58 039	38	10.41 961	9.97 063	5	**10**	7 | 3.8 | 0.6 | 0.5
51	9.55 136	34	9.58 077	38	10.41 923	9.97 059	4	9	8 | 4.4 | 0.7 | 0.5
52	9.55 169	33	9.58 115	38	10.41 885	9.97 054	5	8	9 | 5.0 | 0.8 | 0.6
53	9.55 202	33	9.58 153	38	10.41 847	9.97 049	5	7	10 | 5.5 | 0.8 | 0.7
54	9.55 235	33	9.58 191	38	10.41 809	9.97 044	5	6	20 | 11.0 | 1.7 | 1.3
55	9.55 268	33	9.58 229	38	10.41 771	9.97 039	5	5	30 | 16.5 | 2.5 | 2.0
56	9.55 301	33	9.58 267	38	10.41 733	9.97 035	4	4	40 | 22.0 | 3.3 | 2.7
57	9.55 334	33	9.58 304	37	10.41 696	9.97 030	5	3	50 | 27.5 | 4.2 | 3.3
58	9.55 367	33	9.58 342	38	10.41 658	9.97 025	5	2	
59	9.55 400	33	9.58 380	38	10.41 620	9.97 020	5	1	
60	9.55 433		9.58 418		10.41 582	9.97 015		**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

69°

21°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.55 433		9.58 418		10.41 582	9.97 015		**60**	
1	9.55 466	33	9.58 455	37	10.41 545	9.97 010	5	59	
2	9.55 499	33	9.58 493	38	10.41 507	9.97 005	5	58	
3	9.55 532	33	9.58 531	38	10.41 469	9.97 001	4	57	
4	9.55 564	32	9.58 569	38	10.41 431	9.96 996	5	56	
5	9.55 597	33	9.58 606	37	10.41 394	9.96 991	5	55	
6	9.55 630	33	9.58 644	38	10.41 356	9.96 986	5	54	
7	9.55 663	33	9.58 681	37	10.41 319	9.96 981	5	53	
8	9.55 695	32	9.58 719	38	10.41 281	9.96 876	5	52	
9	9.55 728	33	9.58 757	38	10.41 243	9.96 971	5	51	
10	9.55 761	33	9.58 794	37	10.41 206	9.96 966	5	**50**	
11	9.55 793	32	9.58 832	38	10.41 168	9.96 962	4	49	
12	9.55 826	33	9.58 869	37	10.41 131	9.96 957	5	48	
13	9.55 858	32	9.58 907	38	10.41 093	9.96 952	5	47	
14	9.55 891	33	9.58 944	37	10.41 056	9.96 947	5	46	
15	9.55 923	32	9.58 981	37	10.41 019	9.96 942	5	45	
16	9.55 956	33	9.59 019	38	10.40 981	9.96 937	5	44	
17	9.55 988	32	9.59 056	37	10.40 944	9.96 932	5	43	
18	9.56 021	33	9.59 094	38	10.40 906	9.96 927	5	42	
19	9.56 053	32	9.59 131	37	10.40 869	9.96 922	5	41	
20	9.56 085	32	9.59 168	37	10.40 832	9.96 917	5	**40**	
21	9.56 118	33	9.59 205	37	10.40 795	9.96 912	5	39	
22	9.56 150	32	9.59 243	38	10.40 757	9.96 907	5	38	
23	9.56 182	32	9.59 280	37	10.40 720	9.96 903	4	37	
24	9.56 215	33	9.59 317	37	10.40 683	9.96 898	5	36	
25	9.56 247	32	9.59 354	37	10.40 646	9.96 893	5	35	
26	9.56 279	32	9.59 391	37	10.40 609	9.96 888	5	34	
27	9.56 311	32	9.59 429	38	10.40 571	9.96 883	5	33	
28	9.56 343	32	9.59 466	37	10.40 534	9.96 878	5	32	
29	9.56 375	32	9.59 503	37	10.40 497	9.96 873	5	31	
30	9.56 408	33	9.59 540	37	10.40 460	9.96 868	5	**30**	
31	9.56 440	32	9.59 577	37	10.40 423	9.96 863	5	29	
32	9.56 472	32	9.59 614	37	10.40 386	9.96 858	5	28	
33	9.56 504	32	9.59 651	37	10.40 349	9.96 853	5	27	
34	9.56 536	32	9.59 688	37	10.40 312	9.96 848	5	26	
35	9.56 568	32	9.59 725	37	10.40 275	9.96 843	5	25	
36	9.56 599	31	9.59 762	37	10.40 238	9.96 838	5	24	
37	9.56 631	32	9.59 799	36	10.40 201	9.96 833	5	23	
38	9.56 663	32	9.59 835	37	10.40 165	9.96 828	5	22	
39	9.56 695	32	9.59 872	37	10.40 128	9.96 823	5	21	
40	9.56 727	32	9.59 909	37	10.40 091	9.96 818	5	**20**	
41	9.56 759	31	9.59 946	37	10.40 054	9.96 813	5	19	
42	9.56 790	32	9.59 983	36	10.40 017	9.96 808	5	18	
43	9.56 822	32	9.60 019	37	10.39 981	9.96 803	5	17	
44	9.56 854	32	9.60 056	37	10.39 944	9.96 798	5	16	
45	9.56 886	31	9.60 093	37	10.39 907	9.96 793	5	15	
46	9.56 917	32	9.60 130	36	10.39 870	9.96 788	5	14	
47	9.56 949	31	9.60 166	37	10.39 834	9.96 783	5	13	
48	9.56 980	32	9.60 203	37	10.39 797	9.96 778	5	12	
49	9.57 012	32	9.60 240	36	10.39 760	9.96 772	6	11	
50	9.57 044	31	9.60 276	37	10.39 724	9.96 767	5	**10**	
51	9.57 075	32	9.60 313	36	10.39 687	9.96 762	5	9	
52	9.57 107	31	9.60 349	37	10.39 651	9.96 757	5	8	
53	9.57 138	31	9.60 386	36	10.39 614	9.96 752	5	7	
54	9.57 169	32	9.60 422	37	10.39 578	9.96 747	5	6	
55	9.57 201	31	9.60 459	36	10.39 541	9.96 742	5	5	
56	9.57 232	32	9.60 495	37	10.39 505	9.96 737	5	4	
57	9.57 264	31	9.60 532	36	10.39 468	9.96 732	5	3	
58	9.57 295	31	9.60 568	37	10.39 432	9.96 727	5	2	
59	9.57 326	32	9.60 605	36	10.39 395	9.96 722	5	1	
60	9.57 358		9.60 641		10.39 359	9.96 717		**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	38	37	36
6	3.8	3.7	3.6
7	4.4	4.3	4.2
8	5.1	4.9	4.8
9	5.7	5.6	5.4
10	6.3	6.2	6.0
20	12.7	12.3	12.0
30	19.0	18.5	18.0
40	25.3	24.7	24.0
50	31.7	30.8	30.0

″	33	32	31
6	3.3	3.2	3.1
7	3.9	3.7	3.6
8	4.4	4.3	4.1
9	5.0	4.8	4.6
10	5.5	5.3	5.2
20	11.0	10.7	10.3
30	16.5	16.0	15.5
40	22.0	21.3	20.7
50	27.5	26.7	25.8

″	6	5	4
6	0.6	0.5	0.4
7	0.7	0.6	0.5
8	0.8	0.7	0.5
9	0.9	0.8	0.6
10	1.0	0.8	0.7
20	2.0	1.7	1.3
30	3.0	2.5	2.0
40	4.0	3.3	2.7
50	5.0	4.2	3.3

68°

22°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.57 358		9.60 641		10.39 359	9.96 717		**60**	
1	9.57 389	31	9.60 677	36	10.39 323	9.96 711	6	59	
2	9.57 420	31	9.60 714	37	10.39 286	9.96 706	5	58	
3	9.57 451	31	9.60 750	36	10.39 250	9.96 701	5	57	
4	9.57 482	31	9.60 786	36	10.39 214	9.96 696	5	56	
5	9.57 514	32	9.60 823	37	10.39 177	9.96 691	5	55	
6	9.57 545	31	9.60 859	36	10.39 141	9.96 686	5	54	
7	9.57 576	31	9.60 895	36	10.39 105	9.96 681	5	53	
8	9.57 607	31	9.60 931	36	10.39 069	9.96 676	5	52	
9	9.57 638	31	9.60 967	36	10.39 033	9.96 670	6	51	
10	9.57 669	31	9.61 004	37	10.38 996	9.96 665	5	**50**	
11	9.57 700	31	9.61 040	36	10.38 960	9.96 660	5	49	
12	9.57 731	31	9.61 076	36	10.38 924	9.96 655	5	48	
13	9.57 762	31	9.61 112	36	10.38 888	9.96 650	5	47	
14	9.57 793	31	9.61 148	36	10.38 852	9.96 645	5	46	
15	9.57 824	31	9.61 184	36	10.38 816	9.96 640	5	45	
16	9.57 855	31	9.61 220	36	10.38 780	9.96 634	6	44	
17	9.57 885	30	9.61 256	36	10.38 744	9.96 629	5	43	
18	9.57 916	31	9.61 292	36	10.38 708	9.96 624	5	42	
19	9.57 947	31	9.61 328	36	10.38 672	9.96 619	5	41	
20	9.57 978	31	9.61 364	36	10.38 636	9.96 614	5	**40**	
21	9.58 008	30	9.61 400	36	10.38 600	9.96 608	6	39	
22	9.58 039	31	9.61 436	36	10.38 564	9.96 603	5	38	
23	9.58 070	31	9.61 472	36	10.38 528	9.96 598	5	37	
24	9.58 101	31	9.61 508	36	10.38 492	9.96 593	5	36	
25	9.58 131	30	9.61 544	36	10.38 456	9.96 588	5	35	
26	9.58 162	31	9.61 579	35	10.38 421	9.96 582	6	34	
27	9.58 192	30	9.61 615	36	10.38 385	9.96 577	5	33	
28	9.58 223	31	9.61 651	36	10.38 349	9.96 572	5	32	
29	9.58 253	30	9.61 687	36	10.38 313	9.96 567	5	31	
30	9.58 284	31	9.61 722	35	10.38 278	9.96 562	5	**30**	
31	9.58 314	30	9.61 758	36	10.38 242	9.96 556	6	29	
32	9.58 345	31	9.61 794	36	10.38 206	9.96 551	5	28	
33	9.58 375	30	9.61 830	36	10.38 170	9.96 546	5	27	
34	9.58 406	31	9.61 865	35	10.38 135	9.96 541	5	26	
35	9.58 436	30	9.61 901	36	10.38 099	9.96 535	6	25	
36	9.58 467	31	9.61 936	35	10.38 064	9.96 530	5	24	
37	9.58 497	30	9.61 972	36	10.38 028	9.96 525	5	23	
38	9.58 527	30	9.62 008	36	10.37 992	9.96 520	5	22	
39	9.58 557	30	9.62 043	35	10.37 957	9.96 514	6	21	
40	9.58 588	31	9.62 079	36	10.37 921	9.96 509	5	**20**	
41	9.58 618	30	9.62 114	35	10.37 886	9.96 504	5	19	
42	9.58 648	30	9.62 150	36	10.37 850	9.96 498	6	18	
43	9.58 678	30	9.62 185	35	10.37 815	9.96 493	5	17	
44	9.58 709	31	9.62 221	36	10.37 779	9.96 488	5	16	
45	9.58 739	30	9.62 256	35	10.37 744	9.96 483	5	15	
46	9.58 769	30	9.62 292	36	10.37 708	9.96 477	6	14	
47	9.58 799	30	9.62 327	35	10.37 673	9.96 472	5	13	
48	9.58 829	30	9.62 362	35	10.37 638	9.96 467	5	12	
49	9.58 859	30	9.62 398	36	10.37 602	9.96 461	6	11	
50	9.58 889	30	9.62 433	35	10.37 567	9.96 456	5	**10**	
51	9.58 919	30	9.62 468	35	10.37 532	9.96 451	5	9	
52	9.58 949	30	9.62 504	36	10.37 496	9.96 445	6	8	
53	9.58 979	30	9.62 539	35	10.37 461	9.96 440	5	7	
54	9.59 009	30	9.62 574	35	10.37 426	9.96 435	5	6	
55	9.59 039	30	9.62 609	35	10.37 391	9.96 429	6	5	
56	9.59 069	30	9.62 645	36	10.37 355	9.96 424	5	4	
57	9.59 098	29	9.62 680	35	10.37 320	9.96 419	5	3	
58	9.59 128	30	9.62 715	35	10.37 285	9.96 413	6	2	
59	9.59 158	30	9.62 750	35	10.37 250	9.96 408	5	1	
60	9.59 188	30	9.62 785	35	10.37 215	9.96 403	5	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	37	36	35
6	3.7	3.6	3.5
7	4.3	4.2	4.1
8	4.9	4.8	4.7
9	5.6	5.4	5.2
10	6.2	6.0	5.8
20	12.3	12.0	11.7
30	18.5	18.0	17.5
40	24.7	24.0	23.3
50	30.8	30.0	29.2

″	32	31	30
6	3.2	3.1	3.0
7	3.7	3.6	3.5
8	4.3	4.1	4.0
9	4.8	4.6	4.5
10	5.3	5.2	5.0
20	10.7	10.3	10.0
30	16.0	15.5	15.0
40	21.3	20.7	20.0
50	26.7	25.8	25.0

″	29	6	5
6	2.9	0.6	0.5
7	3.4	0.7	0.6
8	3.9	0.8	0.7
9	4.4	0.9	0.8
10	4.8	1.0	0.8
20	9.7	2.0	1.7
30	14.5	3.0	2.5
40	19.3	4.0	3.3
50	24.2	5.0	4.2

67°

23°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.59 188		9.62 785		10.37 215	9.96 403		**60**	
1	9.59 218	30	9.62 820	35	10.37 180	9.96 397	6	59	
2	9.59 247	29	9.62 855	35	10.37 145	9.96 392	5	58	
3	9.59 277	30	9.62 890	35	10.37 110	9.96 387	5	57	
4	9.59 307	30	9.62 926	36	10.37 074	9.96 381	6	56	
5	9.59 336	29	9.62 961	35	10.37 039	9.96 376	5	55	
6	9.59 366	30	9.62 996	35	10.37 004	9.96 370	6	54	
7	9.59 396	30	9.63 031	35	10.36 969	9.96 365	5	53	
8	9.59 425	29	9.63 066	35	10.36 934	9.96 360	5	52	
9	9.59 455	30	9.63 101	35	10.36 899	9.96 354	6	51	
10	9.59 484	29	9.63 135	34	10.36 865	9.96 349	5	**50**	
11	9.59 514	30	9.63 170	35	10.36 830	9.96 343	6	49	
12	9.59 543	29	9.63 205	35	10.36 795	9.96 338	5	48	
13	9.59 573	30	9.63 240	35	10.36 760	9.96 333	5	47	
14	9.59 602	29	9.63 275	35	10.36 725	9.96 327	6	46	
15	9.59 632	30	9.63 310	35	10.36 690	9.96 322	5	45	
16	9.59 661	29	9.63 345	35	10.36 655	9.96 316	6	44	
17	9.59 690	29	9.63 379	34	10.36 621	9.96 311	5	43	
18	9.59 720	30	9.63 414	35	10.36 586	9.96 305	6	42	
19	9.59 749	29	9.63 449	35	10.36 551	9.96 300	5	41	
20	9.59 778	29	9.63 484	35	10.36 516	9.96 294	6	**40**	
21	9.59 808	30	9.63 519	35	10.36 481	9.96 289	5	39	
22	9.59 837	29	9.63 553	34	10.36 447	9.96 284	5	38	
23	9.59 866	29	9.63 588	35	10.36 412	9.96 278	6	37	
24	9.59 895	29	9.63 623	35	10.36 377	9.96 273	5	36	
25	9.59 924	29	9.63 657	34	10.36 343	9.96 267	6	35	
26	9.59 954	30	9.63 692	35	10.36 308	9.96 262	5	34	
27	9.59 983	29	9.63 726	34	10.36 274	9.96 256	6	33	
28	9.60 012	29	9.63 761	35	10.36 239	9.96 251	5	32	
29	9.60 041	29	9.63 796	35	10.36 204	9.96 245	6	31	
30	9.60 070	29	9.63 830	34	10.36 170	9.96 240	5	**30**	
31	9.60 099	29	9.63 865	35	10.36 135	9.96 234	6	29	
32	9.60 128	29	9.63 899	34	10.36 101	9.96 229	5	28	
33	9.60 157	29	9.63 934	35	10.36 066	9.96 223	6	27	
34	9.60 186	29	9.63 968	34	10.36 032	9.96 218	5	26	
35	9.60 215	29	9.64 003	35	10.35 997	9.96 212	6	25	
36	9.60 244	29	9.64 037	34	10.35 963	9.96 207	5	24	
37	9.60 273	29	9.64 072	35	10.35 928	9.96 201	6	23	
38	9.60 302	29	9.64 106	34	10.35 894	9.96 196	5	22	
39	9.60 331	29	9.64 140	34	10.35 860	9.96 190	6	21	
40	9.60 359	28	9.64 175	35	10.35 825	9.96 185	5	**20**	
41	9.60 388	29	9.64 209	34	10.35 791	9.96 179	6	19	
42	9.60 417	29	9.64 243	34	10.35 757	9.96 174	5	18	
43	9.60 446	29	9.64 278	35	10.35 722	9.96 168	6	17	
44	9.60 474	28	9.64 312	34	10.35 688	9.96 162	6	16	
45	9.60 503	29	9.64 346	34	10.35 654	9.96 157	5	15	
46	9.60 532	29	9.64 381	35	10.35 619	9.96 151	6	14	
47	9.60 561	29	9.64 415	34	10.35 585	9.96 146	5	13	
48	9.60 589	28	9.64 449	34	10.35 551	9.96 140	6	12	
49	9.60 618	29	9.64 483	34	10.35 517	9.96 135	5	11	
50	9.60 646	28	9.64 517	34	10.35 483	9.96 129	6	**10**	
51	9.60 675	29	9.64 552	35	10.35 448	9.96 123	6	9	
52	9.60 704	29	9.64 586	34	10.35 414	9.96 118	5	8	
53	9.60 732	28	9.64 620	34	10.35 380	9.96 112	6	7	
54	9.60 761	29	9.64 654	34	10.35 346	9.96 107	5	6	
55	9.60 789	28	9.64 688	34	10.35 312	9.96 101	6	5	
56	9.60 818	29	9.64 722	34	10.35 278	9.96 095	6	4	
57	9.60 846	28	9.64 756	34	10.35 244	9.96 090	5	3	
58	9.60 875	29	9.64 790	34	10.35 210	9.96 084	6	2	
59	9.60 903	28	9.64 824	34	10.35 176	9.96 079	5	1	
60	9.60 931	28	9.64 858	34	10.35 142	9.96 073	6	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	36	35	34
6	3.6	3.5	3.4
7	4.2	4.1	4.0
8	4.8	4.7	4.5
9	5.4	5.2	5.1
10	6.0	5.8	5.7
20	12.0	11.7	11.3
30	18.0	17.5	17.0
40	24.0	23.3	22.7
50	30.0	29.2	28.3

″	30	29	28
6	3.0	2.9	2.8
7	3.5	3.4	3.3
8	4.0	3.9	3.7
9	4.5	4.4	4.2
10	5.0	4.8	4.7
20	10.0	9.7	9.3
30	15.0	14.5	14.0
40	20.0	19.3	18.7
50	25.0	24.2	23.3

″	6	5
6	0.6	0.5
7	0.7	0.6
8	0.8	0.7
9	0.9	0.8
10	1.0	0.8
20	2.0	1.7
30	3.0	2.5
40	4.0	3.3
50	5.0	4.2

66°

24°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.60 931		9.64 858		10.35 142	9.96 073		**60**	
1	9.60 960	29	9.64 892	34	10.35 108	9.96 067	6	59	
2	9.60 988	28	9.64 926	34	10.35 074	9.96 062	5	58	
3	9.61 016	28	9.64 960	34	10.35 040	9.96 056	6	57	
4	9.61 045	29	9.64 994	34	10.35 006	9.96 050	6	56	
5	9.61 073	28	9.65 028	34	10.34 972	9.96 045	5	55	
6	9.61 101	28	9.65 062	34	10.34 938	9.96 039	6	54	
7	9.61 129	28	9.65 096	34	10.34 904	9.96 034	5	53	
8	9.61 158	29	9.65 130	34	10.34 870	9.96 028	6	52	
9	9.61 186	28	9.65 164	34	10.34 836	9.96 022	6	51	
10	9.61 214	28	9.65 197	33	10.34 803	9.96 017	5	**50**	
11	9.61 242	28	9.65 231	34	10.34 769	9.96 011	6	49	
12	9.61 270	28	9.65 265	34	10.34 735	9.96 005	6	48	
13	9.61 298	28	9.65 299	34	10.34 701	9.96 000	5	47	
14	9.61 326	28	9.65 333	34	10.34 667	9.95 994	6	46	
15	9.61 354	28	9.65 366	33	10.34 634	9.95 988	6	45	
16	9.61 382	28	9.65 400	34	10.34 600	9.95 982	6	44	
17	9.61 411	29	9.65 434	34	10.34 566	9.95 977	5	43	
18	9.61 438	27	9.65 467	33	10.34 533	9.95 971	6	42	
19	9.61 466	28	9.65 501	34	10.34 499	9.95 965	6	41	
20	9.61 494	28	9.65 535	34	10.34 465	9.95 960	5	**40**	
21	9.61 522	28	9.65 568	33	10.34 432	9.95 954	6	39	
22	9.61 550	28	9.65 602	34	10.34 398	9.95 948	6	38	
23	9.61 578	28	9.65 636	34	10.34 364	9.95 942	6	37	
24	9.61 606	28	9.65 669	33	10.34 331	9.95 937	5	36	
25	9.61 634	28	9.65 703	34	10.34 297	9.95 931	6	35	
26	9.61 662	28	9.65 736	33	10.34 264	9.95 925	6	34	
27	9.61 689	27	9.65 770	34	10.34 230	9.95 920	5	33	
28	9.61 717	28	9.65 803	33	10.34 197	9.95 914	6	32	
29	9.61 745	28	9.65 837	34	10.34 163	9.95 908	6	31	
30	9.61 773	28	9.65 870	33	10.34 130	9.95 902	6	**30**	
31	9.61 800	27	9.65 904	34	10.34 096	9.95 897	5	29	
32	9.61 828	28	9.65 937	33	10.34 063	9.95 891	6	28	
33	9.61 856	28	9.65 971	34	10.34 029	9.95 885	6	27	
34	9.61 883	27	9.66 004	33	10.33 996	9.95 879	6	26	
35	9.61 911	28	9.66 038	34	10.33 962	9.95 873	6	25	
36	9.61 939	28	9.66 071	33	10.33 929	9.95 868	5	24	
37	9.61 966	27	9.66 104	33	10.33 896	9.95 862	6	23	
38	9.61 994	28	9.66 138	34	10.33 862	9.95 856	6	22	
39	9.62 021	27	9.66 171	33	10.33 829	9.95 850	6	21	
40	9.62 049	28	9.66 204	33	10.33 796	9.95 844	6	**20**	
41	9.62 076	27	9.66 238	34	10.33 762	9.95 839	5	19	
42	9.62 104	28	9.66 271	33	10.33 729	9.95 833	6	18	
43	9.62 131	27	9.66 304	33	10.33 696	9.95 827	6	17	
44	9.62 159	28	9.66 337	33	10.33 663	9.95 821	6	16	
45	9.62 186	27	9.66 371	34	10.33 629	9.95 815	6	15	
46	9.62 214	28	9.66 404	33	10.33 596	9.95 810	5	14	
47	9.62 241	27	9.66 437	33	10.33 563	9.95 804	6	13	
48	9.62 268	27	9.66 470	33	10.33 530	9.95 798	6	12	
49	9.62 296	28	9.66 503	33	10.33 497	9.95 792	6	11	
50	9.62 323	27	9.66 537	34	10.33 463	9.95 786	6	**10**	
51	9.62 350	27	9.66 570	33	10.33 430	9.95 780	6	9	
52	9.62 377	27	9.66 603	33	10.33 397	9.95 775	5	8	
53	9.62 405	28	9.66 636	33	10.33 364	9.95 769	6	7	
54	9.62 432	27	9.66 669	33	10.33 331	9.95 763	6	6	
55	9.62 459	27	9.66 702	33	10.33 298	9.95 757	6	5	
56	9.62 486	27	9.66 735	33	10.33 265	9.95 751	6	4	
57	9.62 513	27	9.66 768	33	10.33 232	9.95 745	6	3	
58	9.62 541	28	9.66 801	33	10.33 199	9.95 739	6	2	
59	9.62 568	27	9.66 834	33	10.33 166	9.95 733	6	1	
60	9.62 595	27	9.66 867	33	10.33 133	9.95 728	5	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	34	33
6	3.4	3.3
7	4.0	3.8
8	4.5	4.4
9	5.1	5.0
10	5.7	5.5
20	11.3	11.0
30	17.0	16.5
40	22.7	22.0
50	28.3	27.5

″	29	28	27
6	2.9	2.8	2.7
7	3.4	3.3	3.2
8	3.9	3.7	3.6
9	4.4	4.2	4.0
10	4.8	4.7	4.5
20	9.7	9.3	9.0
30	14.5	14.0	13.5
40	19.3	18.7	18.0
50	24.2	23.3	22.5

″	6	5
6	0.6	0.5
7	0.7	0.6
8	0.8	0.7
9	0.9	0.8
10	1.0	0.8
20	2.0	1.7
30	3.0	2.5
40	4.0	3.3
50	5.0	4.2

65°

25°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.62 595		9.66 867		10.33 133	9.95 728		**60**	
1	9.62 622	27	9.66 900	33	10.33 100	9.95 722	6	59	
2	9.62 649	27	9.66 933	33	10.33 067	9.95 716	6	58	
3	9.62 676	27	9.66 966	33	10.33 034	9.95 710	6	57	
4	9.62 703	27	9.66 999	33	10.33 001	9.95 704	6	56	
5	9.62 730	27	9.67 032	33	10.32 968	9.95 698	6	55	
6	9.62 757	27	9.67 065	33	10.32 935	9.95 692	6	54	
7	9.62 784	27	9.67 098	33	10.32 902	9.95 686	6	53	
8	9.62 811	27	9.67 131	33	10.32 869	9.95 680	6	52	
9	9.62 838	27	9.67 163	32	10.32 837	9.95 674	6	51	
10	9.62 865	27	9.67 196	33	10.32 804	9.95 668	6	**50**	
11	9.62 892	27	9.67 229	33	10.32 771	9.95 663	5	49	
12	9.62 918	26	9.67 262	33	10.32 738	9.95 657	6	48	
13	9.62 945	27	9.67 295	33	10.32 705	9.95 651	6	47	
14	9.62 972	27	9.67 327	32	10.32 673	9.95 645	6	46	
15	9.62 999	27	9.67 360	33	10.32 640	9.95 639	6	45	
16	9.63 026	27	9.67 393	33	10.32 607	9.95 633	6	44	
17	9.63 052	26	9.67 426	33	10.32 574	9.95 627	6	43	
18	9.63 079	27	9.67 458	32	10.32 542	9.95 621	6	42	
19	9.63 106	27	9.67 491	33	10.32 509	9.95 615	6	41	
20	9.63 133	27	9.67 524	33	10.32 476	9.95 609	6	**40**	
21	9.63 159	26	9.67 556	32	10.32 444	9.95 603	6	39	
22	9.63 186	27	9.67 589	33	10.32 411	9.95 597	6	38	
23	9.63 213	27	9.67 622	33	10.32 378	9.95 591	6	37	
24	9.63 239	26	9.67 654	32	10.32 346	9.95 585	6	36	
25	9.63 266	27	9.67 687	33	10.32 313	9.95 579	6	35	
26	9.63 292	26	9.67 719	32	10.32 281	9.95 573	6	34	
27	9.63 319	27	9.67 752	33	10.32 248	9.95 567	6	33	
28	9.63 345	26	9.67 785	33	10.32 215	9.95 561	6	32	
29	9.63 372	27	9.67 817	32	10.32 183	9.95 555	6	31	
30	9.63 398	26	9.67 850	33	10.32 150	9.95 549	6	**30**	
31	9.63 425	27	9.67 882	32	10.32 118	9.95 543	6	29	
32	9.63 451	26	9.67 915	33	10.32 085	9.95 537	6	28	
33	9.63 478	27	9.67 947	32	10.32 053	9.95 531	6	27	
34	9.63 504	26	9.67 980	33	10.32 020	9.95 525	6	26	
35	9.63 531	27	9.68 012	32	10.31 988	9.95 519	6	25	
36	9.63 557	26	9.68 044	32	10.31 956	9.95 513	6	24	
37	9.63 583	26	9.68 077	33	10.31 923	9.95 507	6	23	
38	9.63 610	27	9.68 109	32	10.31 891	9.95 500	7	22	
39	9.63 636	26	9.68 142	33	10.31 858	9.95 494	6	21	
40	9.63 662	26	9.68 174	32	10.31 826	9.95 488	6	**20**	
41	9.63 689	27	9.68 206	32	10.31 794	9.95 482	6	19	
42	9.63 715	26	9.68 239	33	10.31 761	9.95 476	6	18	
43	9.63 741	26	9.68 271	32	10.31 729	9.95 470	6	17	
44	9.63 767	26	9.68 303	32	10.31 697	9.95 464	6	16	
45	9.63 794	27	9.68 336	33	10.31 664	9.95 458	6	15	
46	9.63 820	26	9.68 368	32	10.31 632	9.95 452	6	14	
47	9.63 846	26	9.68 400	32	10.31 600	9.95 446	6	13	
48	9.63 872	26	9.68 432	32	10.31 568	9.95 440	6	12	
49	9.63 898	26	9.68 465	33	10.31 535	9.95 434	6	11	
50	9.63 924	26	9.68 497	32	10.31 503	9.95 427	7	**10**	
51	9.63 950	26	9.68 529	32	10.31 471	9.95 421	6	9	
52	9.63 976	26	9.68 561	32	10.31 439	9.95 415	6	8	
53	9.64 002	26	9.68 593	32	10.31 407	9.95 409	6	7	
54	9.64 028	26	9.68 626	33	10.31 374	9.95 403	6	6	
55	9.64 054	26	9.68 658	32	10.31 342	9.95 397	6	5	
56	9.64 080	26	9.68 690	32	10.31 310	9.95 391	6	4	
57	9.64 106	26	9.68 722	32	10.31 278	9.95 384	7	3	
58	9.64 132	26	9.68 754	32	10.31 246	9.95 378	6	2	
59	9.64 158	26	9.68 786	32	10.31 214	9.95 372	6	1	
60	9.64 184		9.68 818		10.31 182	9.95 366	6	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	33	32
6	3.3	3.2
7	3.8	3.7
8	4.4	4.3
8	5.0	4.8
10	5.5	5.3
20	11.0	10.7
30	16.5	16.0
40	22.0	21.3
50	27.5	26.7

″	27	26
6	2.7	2.6
7	3.2	3.0
8	3.6	3.5
9	4.0	3.9
10	4.5	4.3
20	9.0	8.7
30	13.5	13.0
40	18.0	17.3
50	22.5	21.7

″	7	6	5
6	0.7	0.6	0.5
7	0.8	0.7	0.6
8	0.9	0.8	0.7
9	1.0	0.9	0.8
10	1.2	1.0	0.8
20	2.3	2.0	1.7
30	3.5	3.0	2.5
40	4.7	4.0	3.3
50	5.8	5.0	4.2

81°

26°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.64 184		9.68 818		10.31 182	9.95 366		**60**	
1	9.64 210	26	9.68 850	32	10.31 150	9.95 360	6	59	
2	9.64 236	26	9.68 882	32	10.31 118	9.95 354	6	58	
3	9.64 262	26	9.68 914	32	10.31 086	9.95 348	6	57	
4	9.64 288	26	9.68 946	32	10.31 054	9.95 341	7	56	
5	9.64 313	25	9.68 978	32	10.31 022	9.95 335	6	55	
6	9.64 339	26	9.69 010	32	10.30 990	9.95 329	6	54	
7	9.64 365	26	9.69 042	32	10.30 958	9.95 323	6	53	
8	9.64 391	26	9.69 074	32	10.30 926	9.95 317	6	52	
9	9.64 417	26	9.69 106	32	10.30 894	9.95 310	7	51	
10	9.64 442	25	9.69 138	32	10.30 862	9.95 304	6	**50**	
11	9.64 468	26	9.69 170	32	10.30 830	9.95 298	6	49	
12	9.64 494	26	9.69 202	32	10.30 798	9.95 292	6	48	
13	9.64 519	25	9.69 234	32	10.30 766	9.95 286	6	47	
14	9.64 545	26	9.68 266	32	10.30 734	9.95 279	7	46	
15	9.64 571	26	9.69 298	32	10.30 702	9.95 273	6	45	
16	9.64 596	25	9.69 329	31	10.30 671	9.95 267	6	44	
17	9.64 622	26	9.69 361	32	10.30 639	9.95 261	6	43	
18	9.64 647	25	9.69 393	32	10.30 607	9.95 254	7	42	
19	9.64 673	26	9.69 425	32	10.30 575	9.95 248	6	41	
20	9.64 698	25	9.69 457	32	10.30 543	9.95 242	6	**40**	
21	9.64 724	26	9.69 488	31	10.30 512	9.95 236	6	39	
22	9.64 749	25	9.69 520	32	10.30 480	9.95 229	7	38	
23	9.64 775	26	9.69 552	32	10.30 448	9.95 223	6	37	
24	9.64 800	25	9.69 584	32	10.30 416	9.95 217	6	36	
25	9.64 826	26	9.69 615	31	10.30 385	9.95 211	6	35	
26	9.64 851	25	9.69 647	32	10.30 353	9.95 204	7	34	
27	9.64 877	26	9.69 679	32	10.30 321	9.95 198	6	33	
28	9.64 902	25	9.69 710	31	10.30 290	9.95 192	6	32	
29	9.64 927	25	9.69 742	32	10.30 258	9.95 185	7	31	
30	9.64 953	26	9.69 774	32	10.30 226	9.95 179	6	**30**	
31	9.64 978	25	9.69 805	31	10.30 195	9.95 173	6	29	
32	9.65 003	25	9.69 837	32	10.30 163	9.95 167	6	28	
33	9.65 029	26	9.69 868	31	10.30 132	9.95 160	7	27	
34	9.65 054	25	9.69 900	32	10.30 100	9.95 154	6	26	
35	9.65 079	25	9.69 932	32	10.30 068	9.95 148	6	25	
36	9.65 104	25	9.69 963	31	10.30 037	9.95 141	7	24	
37	9.65 130	26	9.69 995	32	10.30 005	9.95 135	6	23	
38	9.65 155	25	9.70 026	31	10.29 974	9.95 129	6	22	
39	9.65 180	25	9.70 058	32	10.29 942	9.95 122	7	21	
40	9.65 205	25	9.70 089	31	10.29 911	9.95 116	6	**20**	
41	9.65 230	25	9.70 121	32	10.29 879	9.95 110	6	19	
42	9.65 255	25	9.70 152	31	10.29 848	9.95 103	7	18	
43	9.65 281	26	9.70 184	32	10.29 816	9.95 097	6	17	
44	9.65 306	25	9.70 215	31	10.29 785	9.95 090	7	16	
45	9.65 331	25	9.70 247	32	10.29 753	9.95 084	6	15	
46	9.65 356	25	9.70 278	31	10.29 722	9.95 078	6	14	
47	9.65 381	25	9.70 309	31	10.29 691	9.95 071	7	13	
48	9.65 406	25	9.70 341	32	10.29 659	9.95 065	6	12	
49	9.65 431	25	9.70 372	31	10.29 628	9.95 059	6	11	
50	9.65 456	25	9.70 404	32	10.29 596	9.95 052	7	**10**	
51	9.65 481	25	9.70 435	31	10.29 565	9.95 046	6	9	
52	9.65 506	25	9.70 466	31	10.29 534	9.95 039	7	8	
53	9.65 531	25	9.70 498	32	10.29 502	9.95 033	6	7	
54	9.65 556	25	9.70 529	31	10.29 471	9.95 027	6	6	
55	9.65 580	24	9.70 560	31	10.29 440	9.95 020	7	5	
56	9.65 605	25	9.70 592	32	10.29 408	9.95 014	6	4	
57	9.65 630	25	9.70 623	31	10.29 377	9.95 007	7	3	
58	9.65 655	25	9.70 654	31	10.29 346	9.95 001	6	2	
59	9.65 680	25	9.70 685	31	10.29 315	9.94 995	6	1	
60	9.65 705	25	9.70 717	32	10.29 283	9.94 988	7	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	32	31
6	3.2	3.1
7	3.7	3.6
8	4.3	4.1
9	4.8	4.6
10	5.3	5.2
20	10.7	10.3
30	16.0	15.5
40	21.3	20.7
50	26.7	25.8

″	26	25	24
6	2.6	2.5	2.4
7	3.0	2.9	2.8
8	3.5	3.3	3.2
9	3.9	3.8	3.6
10	4.3	4.2	4.0
20	8.7	8.3	8.0
30	13.0	12.5	12.0
40	17.3	16.7	16.0
50	21.7	20.8	20.0

″	7	6
6	0.7	0.6
7	0.8	0.7
8	0.9	0.8
9	1.0	0.9
10	1.2	1.0
20	2.3	2.0
30	3.5	3.0
40	4.7	4.0
50	5.8	5.0

63°

27°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.65 705		9.70 717		10.29 283	9.94 988		**60**	
1	9.65 729	24	9.70 748	31	10.29 252	9.94 982	6	59	
2	9.65 754	25	9.70 779	31	10.29 221	9.94 975	7	58	
3	9.65 779	25	9.70 810	31	10.29 190	9.94 969	6	57	
4	9.65 804	25	9.70 841	31	10.29 159	9.94 962	7	56	
5	9.65 828	24	9.70 873	32	10.29 127	9.94 956	6	55	
6	9.65 853	25	9.70 904	31	10.29 096	9.94 949	7	45	
7	9.65 878	25	9.70 935	31	10.29 065	9.94 943	6	53	
8	9.65 902	24	9.70 966	31	10.29 034	9.94 936	7	52	
9	9.65 927	25	9.70 997	31	10.29 003	9.94 930	6	51	
10	9.65 952	25	9.71 028	31	10.28 972	9.94 923	7	**50**	
11	9.65 976	24	9.71 059	31	10.28 941	9.94 917	6	49	
12	9.66 001	25	9.71 090	31	10.28 910	9.94 911	6	48	
13	9.66 025	24	9.71 121	31	10.28 879	9.94 904	7	47	
14	9.66 050	25	9.71 153	32	10.28 847	9.94 898	6	46	
15	9.66 075	25	9.71 184	31	10.28 816	9.94 891	7	45	
16	9.66 099	24	9.71 215	31	10.28 785	9.94 885	6	44	
17	9.66 124	25	9.71 246	31	10.28 754	9.94 878	7	43	
18	9.66 148	24	9.71 277	31	10.28 723	9.94 871	7	42	
19	9.66 173	25	9.71 308	31	10.28 692	9.94 865	6	41	
20	9.66 197	24	9.71 339	31	10.28 661	9.94 858	7	**40**	
21	9.66 221	24	9.71 370	31	10.28 630	9.94 852	6	39	
22	9.66 246	25	9.71 401	31	10.28 599	9.94 845	7	38	
23	9.66 270	24	9.71 431	30	10.28 569	9.94 839	6	37	
24	9.66 295	25	9.71 462	31	10.28 538	9.94 832	7	36	
25	9.66 319	24	9.71 493	31	10.28 507	9.94 826	6	35	
26	9.66 343	24	9.71 524	31	10.28 476	9.94 819	7	34	
27	9.66 368	25	9.71 555	31	10.28 445	9.94 813	6	33	
28	9.66 392	24	9.71 586	31	10.28 414	9.94 806	7	32	
29	9.66 416	24	9.71 617	31	10.28 383	9.94 799	7	31	
30	9.66 441	25	9.71 648	31	10.28 352	9.94 793	6	**30**	
31	9.66 465	24	9.71 679	31	10.28 321	9.94 786	7	29	
32	9.66 489	24	9.71 709	30	10.28 291	9.94 780	6	28	
33	9.66 513	24	9.71 740	31	10.28 260	9.94 773	7	27	
34	9.66 537	24	9.71 771	31	10.28 229	9.94 767	6	26	
35	9.66 562	25	9.71 802	31	10.28 198	9.94 760	7	25	
36	9.66 586	24	9.71 833	31	10.28 167	9.94 753	7	24	
37	9.66 610	24	9.71 863	30	10.28 137	9.94 747	6	23	
38	9.66 634	24	9.71 894	31	10.28 106	9.94 740	7	22	
39	9.66 658	24	9.71 925	31	10.28 075	9.94 734	6	21	
40	9.66 682	24	9.71 955	30	10.28 045	9.94 727	7	**20**	
41	9.66 706	24	9.71 986	31	10.28 014	9.94 720	7	19	
42	9.66 731	25	9.72 017	31	10.27 983	9.94 714	6	18	
43	9.66 755	24	9.72 048	31	10.27 952	9.94 707	7	17	
44	9.66 779	24	9.72 078	30	10.27 922	9.94 700	7	16	
45	9.66 803	24	9.72 109	31	10.27 891	9.94 694	6	15	
46	9.66 827	24	9.72 140	31	10.27 860	9.94 687	7	14	
47	9.66 851	24	9.72 170	30	10.27 830	9.94 680	7	13	
48	9.66 875	24	9.72 201	31	10.27 799	9.94 674	6	12	
49	9.66 899	24	9.72 231	30	10.27 769	9.94 667	7	11	
50	9.66 922	23	9.72 262	31	10.27 738	9.94 660	7	**10**	
51	9.66 946	24	9.72 293	31	10.27 707	9.94 654	6	9	
52	9.66 970	24	9.72 323	30	10.27 677	9.94 647	7	8	
53	9.66 994	24	9.72 354	31	10.27 646	9.94 640	7	7	
54	9.67 018	24	9.72 384	30	10.27 616	9.94 634	6	6	
55	9.67 042	24	9.72 415	31	10.27 585	9.94 627	7	5	
56	9.67 066	24	9.72 445	30	10.27 555	9.94 620	7	4	
57	9.67 090	24	9.72 476	31	10.27 524	9.94 614	6	3	
58	9.67 113	23	9.72 506	30	10.27 494	9.94 607	7	2	
59	9.67 137	24	9.72 537	31	10.27 463	9.94 600	7	1	
60	9.67 161	24	9.72 567	30	10.27 433	9.94 593	7	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	32	31	30
6	3.2	3.1	3.0
7	3.7	3.6	3.5
8	4.3	4.1	4.0
9	4.8	4.6	4.5
10	5.3	5.2	5.0
20	10.7	10.3	10.0
30	16.0	15.5	15.0
40	21.3	20.7	20.0
50	26.7	25.8	25.0

″	25	24	23
6	2.5	2.4	2.3
7	2.9	2.8	2.7
8	3.3	3.2	3.1
9	3.8	3.6	3.4
10	4.2	4.0	3.8
20	8.3	8.0	7.7
30	12.5	12.0	11.5
40	16.7	16.0	15.3
50	20.8	20.0	19.2

″	7	6
6	0.7	0.6
7	0.8	0.7
8	0.9	0.8
9	1.0	0.9
10	1.2	1.0
20	2.3	2.0
30	3.5	3.0
40	4.7	4.0
50	5.8	5.0

62°

28°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.67 161		9.72 567		10.27 433	9.94 593		**60**	
1	9.67 185	24	9.72 598	31	10.27 402	9.94 587	6	59	
2	9.67 208	23	9.72 628	30	10.27 372	9.94 580	7	58	
3	9.67 232	24	9.72 659	31	10.27 341	9.94 573	7	57	
4	9.67 256	24	9.72 689	30	10.27 311	9.94 567	6	56	
5	9.67 280	24	9.72 720	31	10.27 280	9.94 560	7	55	
6	9.67 303	23	9.72 750	30	10.27 250	9.94 553	7	54	
7	9.67 327	24	9.72 780	30	10.27 220	9.94 546	7	53	
8	9.67 350	23	9.72 811	31	10.27 189	9.94 540	6	52	
9	9.67 374	24	9.72 841	30	10.27 159	9.94 533	7	51	
10	9.67 398	24	9.72 872	31	10.27 128	9.94 526	7	**50**	
11	9.67 421	23	9.72 902	30	10.27 098	9.94 519	7	49	
12	9.67 445	24	9.72 932	30	10.27 068	9.94 513	6	48	
13	9.67 468	23	9.72 963	31	10.27 037	9.94 506	7	47	
14	9.67 492	24	9.72 993	30	10.27 007	9.94 499	7	46	
15	9.67 515	23	9.73 023	30	10.26 977	9.94 492	7	45	
16	9.67 539	24	9.73 054	31	10.26 946	9.94 485	7	44	
17	9.67 562	23	9.73 084	30	10.26 916	9.94 479	6	43	
18	9.67 586	24	9.73 114	30	10.26 886	9.94 472	7	42	
19	9.67 609	23	0.73 144	30	10.26 856	9.94 465	7	41	
20	9.67 633	24	9.73 175	31	10.26 825	9.94 458	7	**40**	
21	9.67 656	23	9.73 205	30	10.26 795	9.94 451	7	39	
22	9.67 680	24	9.73 235	30	10.26 765	9.94 445	6	38	
23	9.67 703	23	9.73 265	30	10.26 735	9.94 438	7	37	
24	9.67 726	23	9.73 295	30	10.26 705	9.94 431	7	36	
25	9.67 750	24	9.73 326	31	10.26 674	9.94 424	7	35	
26	9.67 773	23	9.73 356	30	10.26 644	9.94 417	7	34	
27	9.67 796	23	9.73 386	30	10.26 614	9.94 410	7	33	
28	9.67 820	24	9.73 416	30	10.26 584	9.94 404	6	32	
29	9.67 843	23	9.73 446	30	10.26 554	9.94 397	7	31	
30	9.67 866	23	9.73 476	30	10.26 524	9.94 390	7	**30**	
31	9.67 890	24	9.73 507	31	10.26 493	9.94 383	7	29	
32	9.67 913	23	9.73 537	30	10.26 463	9.94 376	7	28	
33	9.67 936	23	9.73 567	30	10.26 433	9.94 369	7	27	
34	9.67 959	23	9.73 597	30	10.26 403	9.94 362	7	26	
35	9.67 982	23	9.73 627	30	10.26 373	9.94 355	7	25	
36	9.68 006	24	9.73 657	30	10.26 343	9.94 349	6	24	
37	9.68 029	23	9.73 687	30	10.26 313	9.94 342	7	23	
38	9.68 052	23	9.73 717	30	10.26 283	9.94 335	7	22	
39	9.68 075	23	9.73 747	30	10.26 253	9.94 328	7	21	
40	9.68 098	23	9.73 777	30	10.26 223	9.94 321	7	**20**	
41	9.68 121	23	9.73 807	30	10.26 193	9.94 314	7	19	
42	9.68 144	23	9.73 837	30	10.26 163	9.94 307	7	18	
43	9.68 167	23	9.73 867	30	10.26 133	9.94 300	7	17	
44	9.68 190	23	9.73 897	30	10.26 103	9.94 293	7	16	
45	9.68 213	23	9.73 927	30	10.26 073	9.94 286	7	15	
46	9.68 237	24	9.73 957	30	10.26 043	9.94 279	7	14	
47	9.68 260	23	9.73 987	30	10.26 013	9.94 273	6	13	
48	9.68 283	23	9.74 017	30	10.25 983	9.94 266	7	12	
49	9.68 305	22	9.74 047	30	10.25 953	9.94 259	7	11	
50	9.68 328	23	9.74 077	30	10.25 923	9.94 252	7	**10**	
51	9.68 351	23	9.74 107	30	10.25 893	9.94 245	7	9	
52	9.68 374	23	9.74 137	30	10.25 863	9.94 238	7	8	
53	9.68 397	23	9.74 166	29	10.25 834	9.94 231	7	7	
54	9.68 420	23	9.74 196	30	10.25 804	9.94 224	7	6	
55	9.68 443	23	9.74 226	30	10.25 774	9.94 217	7	5	
56	9.68 466	23	9.74 256	30	10.25 744	9.94 210	7	4	
57	9.68 489	23	9.74 286	30	10.25 714	9.94 203	7	3	
58	9.68 512	23	9.74 316	30	10.25 684	9.94 196	7	2	
59	9.68 534	22	9.74 345	29	10.25 655	9.94 189	7	1	
60	9.68 557	23	9.74 375	30	10.25 625	9.94 182	7	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	31	30	29
6	3.1	3.0	2.9
7	3.6	3.5	3.4
8	4.1	4.0	3.9
9	4.6	4.5	4.4
10	5.2	5.0	4.8
20	10.3	10.0	9.7
30	15.5	15.0	14.5
40	20.7	20.0	19.3
50	25.8	25.0	24.2

″	24	23	22
6	2.4	2.3	2.2
7	2.8	2.7	2.6
8	3.2	3.1	2.9
9	3.6	3.4	3.3
10	4.0	3.8	3.7
20	8.0	7.7	7.3
30	12.0	11.5	11.0
40	16.0	15.3	14.7
50	20.0	19.2	18.3

″	7	6
6	0.7	0.6
7	0.8	0.7
8	0.9	0.8
9	1.0	0.9
10	1.2	1.0
20	2.3	2.0
30	3.5	3.0
40	4.7	4.0
50	5.8	5.0

61°

29°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.68 557		9.74 375		10.25 625	9.94 182		**60**	
1	9.68 580	23	9.74 405	30	10.25 595	9.94 175	7	59	
2	9.68 603	23	9.74 435	30	10.25 565	9.94 168	7	58	
3	9.68 625	22	9.74 465	30	10.25 535	9.94 161	7	57	
4	9.68 648	23	9.74 494	29	10.25 506	9.94 154	7	56	
5	9.68 671	23	9.74 524	30	10.25 476	9.94 147	7	55	
6	9.68 694	23	9.74 554	30	10.25 446	9.94 140	7	54	
7	9.68 716	22	9.74 583	29	10.25 417	9.94 133	7	53	
8	9.68 739	23	9.74 613	30	10.25 387	9.94 126	7	52	
9	9.68 762	23	9.74 643	30	10.25 357	9.94 119	7	51	
10	9.68 784	22	9.74 673	30	10.25 327	9.94 112	7	**50**	
11	9.68 807	23	9.74 702	29	10.25 298	9.94 105	7	49	
12	9.68 829	22	9.74 732	30	10.25 268	9.94 098	7	48	
13	9.68 852	23	9.74 762	30	10.25 238	9.94 090	8	47	
14	9.68 875	23	9.74 791	29	10.25 209	9.94 083	7	46	
15	9.68 897	22	9.74 821	30	10.25 179	9.94 076	7	45	
16	9.68 920	23	9.74 851	30	10.25 149	9.94 069	7	44	
17	9.68 942	22	9.74 880	29	10.25 120	9.94 062	7	43	
18	9.68 965	23	9.74 910	30	10.25 090	9.94 055	7	42	
19	9.68 987	22	9.74 939	29	10.25 061	9.94 048	7	41	
20	9.69 010	23	9.74 969	30	10.25 031	9.94 041	7	**40**	
21	9.69 032	22	9.74 998	29	10.25 002	9.94 034	7	39	
22	9.69 055	23	9.75 028	30	10.24 972	9.94 027	7	38	
23	9.69 077	22	9.75 058	30	10.24 942	9.94 020	7	37	
24	9.69 100	23	9.75 087	29	10.24 913	9.94 012	8	36	
25	9.69 122	22	9.75 117	30	10.24 883	9.94 005	7	35	
26	9.69 144	22	9.75 146	29	10.24 854	9.93 998	7	34	
27	9.69 167	23	9.75 176	30	10.24 824	9.93 991	7	33	
28	9.69 189	22	9.75 205	29	10.24 795	9.93 984	7	32	
29	9.69 212	23	9.75 235	30	10.24 765	9.93 977	7	31	
30	9.69 234	22	9.75 264	29	10.24 736	9.93 970	7	**30**	
31	9.69 256	22	9.75 294	30	10.24 706	9.93 963	8	29	
32	9.69 279	23	9.75 323	29	10.24 677	9.93 955	7	28	
33	9.69 301	22	9.75 353	30	10.24 647	9.93 948	7	27	
34	9.69 323	22	9.75 382	29	10.24 618	9.93 941	7	26	
35	9.69 345	22	9.75 411	29	10.24 589	9.93 934	7	25	
36	9.69 368	23	9.75 441	30	10.24 559	9.93 927	7	24	
37	9.69 390	22	9.75 470	29	10.24 530	9.93 920	8	23	
38	9.69 412	22	9.75 500	30	10.24 500	9.93 912	7	22	
39	9.69 434	22	9.75 529	29	10.24 471	9.93 905	7	21	
40	9.69 456	22	9.75 558	29	10.24 442	9.93 898	7	**20**	
41	9.69 479	23	9.75 588	30	10.24 412	9.93 891	7	19	
42	9.69 501	22	9.75 617	29	10.24 383	9.93 884	8	18	
43	9.69 523	22	9.75 647	30	10.24 353	9.93 876	7	17	
44	9.69 545	22	9.75 676	29	10.24 324	9.93 869	7	16	
45	9.69 567	22	9.75 705	29	10.24 295	9.93 862	7	15	
46	9.69 589	22	9.75 735	30	10.24 265	9.93 855	8	14	
47	9.69 611	22	9.75 764	29	10.24 236	9.93 847	7	13	
48	9.69 633	22	9.75 793	29	10.24 207	9.93 840	7	12	
49	9.69 655	22	9.75 822	29	10.24 178	9.93 833	7	11	
50	9.69 677	22	9.75 852	30	10.24 148	9.93 826	7	**10**	
51	9.69 699	22	9.75 881	29	10.24 119	9.93 819	8	9	
52	9.69 721	22	9.75 910	29	10.24 090	9.93 811	7	8	
53	9.69 743	22	9.75 939	29	10.24 061	9.93 804	7	7	
54	9.69 765	22	9.75 969	30	10.24 031	9.93 797	8	6	
55	9.69 787	22	9.75 998	29	10.24 002	9.93 789	7	5	
56	9.69 809	22	9.76 027	29	10.23 973	9.93 782	7	4	
57	9.69 831	22	9.76 056	29	10.23 944	9.93 775	7	3	
58	9.69 853	22	9.76 086	30	10.23 914	9.93 768	8	2	
59	9.69 875	22	9.76 115	29	10.23 885	9.93 760	7	1	
60	9.69 897		9.76 144	29	10.23 856	9.93 753		**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	30	29
6	3.0	2.9
7	3.5	3.5
8	4.0	3.9
9	4.5	4.4
10	5.0	4.8
20	10.0	9.7
30	15.0	14.5
40	20.0	19.3
50	25.0	24.2

″	23	22
6	2.3	2.2
7	2.7	2.6
8	3.1	2.9
9	3.4	3.3
10	3.8	3.7
20	7.7	7.3
30	11.5	11.0
40	15.3	14.7
50	19.2	18.3

″	8	7
6	0.8	0.7
7	0.9	0.8
8	1.1	0.9
9	1.2	1.0
10	1.3	1.2
20	2.7	2.3
30	4.0	3.5
40	5.3	4.7
50	6.7	5.8

60°

30°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.69 897		9.76 144		10.23 856	9.93 753		**60**	
1	9.69 919	22	9.76 173	29	10.23 827	9.93 746	7	59	
2	9.69 941	22	9.76 202	29	10.23 798	9.93 738	8	58	
3	9.69 963	22	9.76 231	29	10.23 769	9.93 731	7	57	
4	9.69 984	21	9.76 261	30	10.23 739	9.93 724	7	56	
5	9.70 006	22	9.76 290	29	10.23 710	9.93 717	7	55	
6	9.70 028	22	9.76 319	29	10.23 681	9.93 709	8	54	
7	9.70 050	22	9.76 348	29	10.23 652	9.93 702	7	53	
8	9.70 072	22	9.76 377	29	10.23 623	9.93 695	7	52	
9	9.70 093	21	9.76 406	29	10.23 594	9.93 687	8	51	
10	9.70 115	22	9.76 435	29	10.23 565	9.93 680	7	**50**	
11	9.70 137	22	9.76 464	29	10.23 536	9.93 673	7	49	
12	9.70 159	22	9.76 493	29	10.23 507	9.93 665	8	48	
13	9.70 180	21	9.76 522	29	10.23 478	9.93 658	7	47	
14	9.70 202	22	9.76 551	29	10.23 449	9.93 650	8	46	
15	9.70 224	22	9.76 580	29	10.23 420	9.93 643	7	45	
16	9.70 245	21	9.76 609	29	10.23 391	9.93 636	7	44	
17	9.70 267	22	9.76 639	30	10.23 361	9.93 628	8	43	
18	9.70 288	21	9.76 668	29	10.23 332	9.93 621	7	42	
19	9.70 310	22	9.76 697	29	10.23 303	9.93 614	7	41	
20	9.70 332	22	9.76 725	28	10.23 275	9.93 606	8	**40**	
21	9.70 353	21	9.76 754	29	10.23 246	9.93 599	7	39	
22	9.70 375	22	9.76 783	29	10.23 217	9.93 591	8	38	
23	9.70 396	21	9.76 812	29	10.23 188	9.93 584	7	37	
24	9.70 418	22	9.76 841	29	10.23 159	9.93 577	7	36	
25	9.70 439	21	9.76 870	29	10.23 130	9.93 569	8	35	
26	9.70 461	22	9.76 899	29	10.23 101	9.93 562	7	34	
27	9.70 482	21	9.76 928	29	10.23 072	9.93 554	8	33	
28	9.70 504	22	9.76 957	29	10.23 043	9.93 547	7	32	
29	9.70 525	21	9.76 986	29	10.23 014	9.93 539	8	31	
30	9.70 547	22	9.77 015	29	10.22 985	9.93 532	7	**30**	
31	9.70 568	21	9.77 044	29	10.22 956	9.93 525	7	29	
32	9.70 590	22	9.77 073	29	10.22 927	9.93 517	8	28	
33	9.70 611	21	9.77 101	28	10.22 899	9.93 510	7	27	
34	9.70 633	22	9.77 130	29	10.22 870	9.93 502	8	26	
35	9.70 654	21	9.77 159	29	10.22 841	9.93 495	7	25	
36	9.70 675	21	9.77 188	29	10.22 812	9.93 487	8	24	
37	9.70 697	22	9.77 217	29	10.22 783	9.93 480	7	23	
38	9.70 718	21	9.77 246	29	10.22 754	9.93 472	8	22	
39	9.70 739	21	9.77 274	28	10.22 726	9.93 465	7	21	
40	9.70 761	22	9.77 303	29	10.22 697	9.93 457	8	**20**	
41	9.70 782	21	9.77 332	29	10.22 668	9.93 450	7	19	
42	9.70 803	21	9.77 361	29	10.22 639	9.93 442	8	18	
43	9.70 824	21	9.77 390	29	10.22 610	9.93 435	7	17	
44	9.70 846	22	9.77 418	28	10.22 582	9.93 427	8	16	
45	9.70 867	21	9.77 447	29	10.22 553	9.93 420	7	15	
46	9.70 888	21	9.77 476	29	10.22 524	9.93 412	8	14	
47	9.70 909	21	9.77 505	29	10.22 495	9.93 405	7	13	
48	9.70 931	22	9.77 533	28	10.22 467	9.93 397	8	12	
49	9.70 952	21	9.77 562	29	10.22 438	9.93 390	7	11	
50	9.70 973	21	9.77 591	29	10.22 409	9.93 382	8	**10**	
51	9.70 994	21	9.77 619	28	10.22 381	9.93 375	7	9	
52	9.71 015	21	9.77 648	29	10.22 352	9.93 367	8	8	
53	9.71 036	21	9.77 677	29	10.22 323	9.93 360	7	7	
54	9.71 058	22	9.77 706	29	10.22 294	9.93 352	8	6	
55	9.71 079	21	9.77 734	28	10.22 266	9.93 344	8	5	
56	9.71 100	21	9.77 763	29	10.22 237	9.93 337	7	4	
57	9.71 121	21	9.77 791	28	10.22 209	9.93 329	8	3	
58	9.71 142	21	9.77 820	29	10.22 180	9.93 322	7	2	
59	9.71 163	21	9.77 849	29	10.22 151	9.93 314	8	1	
60	9.71 184		9.77 877	28	10.22 123	9.93 307	7	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	30	29	28
6	3.0	2.9	2.8
7	3.5	3.4	3.3
8	4.0	3.9	3.7
9	4.5	4.4	4.2
10	5.0	4.8	4.7
20	10.0	9.7	9.3
30	15.0	14.5	14.0
40	20.0	19.3	18.7
50	25.0	24.2	23.3

″	22	21
6	2.2	2.1
7	2.6	2.4
8	2.9	2.8
9	3.3	3.2
10	3.7	3.5
20	7.3	7.0
30	11.0	10.5
40	14.7	14.0
50	18.3	17.5

″	8	7
6	0.8	0.7
7	0.9	0.8
8	1.1	0.9
9	1.2	1.0
10	1.3	1.2
20	2.7	2.3
30	4.0	3.5
40	5.3	4.7
50	6.7	5.8

59°

31°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.71 184		9.77 877		10.22 123	9.93 307		**60**	
1	9.71 205	21	9.77 906	29	10.22 094	9.93 299	8	59	
2	9.71 226	21	9.77 935	29	10.22 065	9.93 291	8	58	
3	9.71 247	21	9.77 963	28	10.22 037	9.93 284	7	57	
4	9.71 268	21	9.77 992	29	10.22 008	9.93 276	8	56	
5	9.71 289	21	9.78 020	28	10.21 980	9.93 269	7	55	
6	9.71 310	21	9.78 049	29	10.21 951	9.93 261	8	54	
7	9.71 331	21	9.78 077	28	10.21 923	9.93 253	8	53	
8	9.71 352	21	9.78 106	29	10.21 894	9.93 246	7	52	
9	9.71 373	21	9.78 135	29	10.21 865	9.93 238	8	51	
10	9.71 393	20	9.78 163	28	10.21 837	9.93 230	8	**50**	
11	9.71 414	21	9.78 192	29	10.21 808	9.93 223	7	49	
12	9.71 435	21	9.78 220	28	10.21 780	9.93 215	8	48	
13	9.71 456	21	9.78 249	29	10.21 751	9.93 207	8	47	
14	9.71 477	21	9.78 277	28	10.21 723	9.93 200	7	46	
15	9.71 498	21	9.78 306	29	10.21 694	9.93 192	8	45	
16	9.71 519	21	9.78 334	28	10.21 666	9.93 184	8	44	
17	9.71 539	20	9.78 363	29	10.21 637	9.93 177	7	43	
18	9.71 560	21	9.78 391	28	10.21 609	9.93 169	8	42	
19	9.71 581	21	9.78 419	28	10.21 581	9.93 161	8	41	
20	9.71 602	21	9.78 448	29	10.21 552	9.93 154	7	**40**	
21	9.71 622	20	9.78 476	28	10.21 524	9.93 146	8	39	
22	9.71 643	21	9.78 505	29	10.21 495	9.93 138	8	38	
23	9.71 664	21	9.78 533	28	10.21 467	9.93 131	7	37	
24	9.71 685	21	9.78 562	29	10.21 438	9.93 123	8	36	
25	9.71 705	20	9.78 590	28	10.21 410	9.93 115	8	35	
26	9.71 726	21	9.78 618	28	10.21 382	9.93 108	7	34	
27	9.71 747	21	9.78 647	29	10.21 353	9.93 100	8	33	
28	9.71 767	20	9.78 675	28	10.21 325	9.93 092	8	32	
29	9.71 788	21	9.78 704	29	10.21 296	9.93 084	8	31	
30	9.71 809	21	9.78 732	28	10.21 268	9.93 077	7	**30**	
31	9.71 829	20	9.78 760	28	10.21 240	9.93 069	8	29	
32	9.71 850	21	9.78 789	29	10.21 211	9.93 061	8	28	
33	9.71 870	20	9.78 817	28	10.21 183	9.93 053	8	27	
34	9.71 891	21	9.78 845	28	10.21 155	9.93 046	7	26	
35	9.71 911	20	9.78 874	29	10.21 126	9.93 038	8	25	
36	9.71 932	21	9.78 902	28	10.21 098	9.93 030	8	21	
37	9.71 952	20	9.78 930	28	10.21 070	9.93 022	8	23	
38	9.71 973	21	9.78 959	29	10.21 041	9.93 014	8	22	
39	9.71 994	21	9.78 987	28	10.21 013	9.93 007	7	21	
40	9.72 014	20	9.79 015	28	10.20 985	9.92 999	8	**20**	
41	9.72 034	20	9.79 043	28	10.20 957	9.92 991	8	19	
42	9.72 055	21	9.79 072	29	10.20 928	9.92 983	8	18	
43	9.72 075	20	9.79 100	28	10.20 900	9.92 976	7	17	
44	9.72 096	21	9.79 128	28	10.20 872	9.92 968	8	16	
45	9.72 116	20	9.79 156	28	10.20 844	9.92 960	8	15	
46	9.72 137	21	9.79 185	29	10.20 815	9.92 952	8	14	
47	9.72 157	20	9.79 213	28	10.20 787	9.92 944	8	13	
48	9.72 177	20	9.79 241	28	10.20 759	9.92 936	8	12	
49	9.72 198	21	9.79 269	28	10.20 731	9.92 929	7	11	
50	9.72 218	20	9.79 297	28	10.20 703	9.92 921	8	**10**	
51	9.72 238	20	9.79 326	29	10.20 674	9.92 913	8	9	
52	9.72 259	21	9.79 354	28	10.20 646	9.92 905	8	8	
53	9.72 279	20	9.79 382	28	10.20 618	9.92 897	8	7	
54	9.72 299	20	9.79 410	28	10.20 590	9.92 889	8	6	
55	9.72 320	21	9.79 438	28	10.20 562	9.92 881	8	5	
56	9.72 340	20	9.79 466	28	10.20 534	9.92 874	7	4	
57	9.72 360	20	9.79 495	29	10.20 505	9.92 866	8	3	
58	9.72 381	21	9.79 523	28	10.20 477	9.92 858	8	2	
59	9.72 401	20	9.79 551	28	10.20 449	9.92 850	8	1	
60	9.72 421	20	9.79 579	28	10.20 421	9.92 842	8	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	29	28
6	2.9	2.8
7	3.4	3.3
8	3.9	3.7
9	4.4	4.2
10	4.8	4.7
20	9.7	9.3
30	14.5	14.0
40	19.3	18.7
50	24.2	23.3

″	21	20
6	2.1	2.0
7	2.4	2.3
8	2.8	2.7
9	3.2	3.0
10	3.5	3.3
20	7.0	6.7
30	10.5	10.0
40	14.0	13.3
50	17.5	16.7

″	8	7
6	0.8	0.7
7	0.9	0.8
8	1.1	0.9
9	1.2	1.0
10	1.3	1.2
20	2.7	2.3
30	4.0	3.5
40	5.3	4.7
50	6.7	5.8

58°

32°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.72 421		9.79 579		10.20 421	9.92 842		**60**	
1	9.72 441	20	9.79 607	28	10.20 393	9.92 834	8	59	
2	9.72 461	20	9.79 635	28	10.20 365	9.92 826	8	58	
3	9.72 482	21	9.79 663	28	10.20 337	9.92 818	8	57	
4	9.72 502	20	9.79 691	28	10.20 309	9.92 810	8	56	
5	9.72 522	20	9.79 719	28	10.20 281	9.92 803	7	55	
6	9.72 542	20	9.79 747	28	10.20 253	9.92 795	8	54	
7	9.72 562	20	9.79 776	29	10.20 224	9.92 787	8	53	
8	9.72 582	20	9.79 804	28	10.20 196	9.92 779	8	52	
9	9.72 602	20	9.79 832	28	10.20 168	9.92 771	8	51	
10	9.72 622	20	9.79 860	28	10.20 140	9.92 763	8	**50**	
11	9.72 643	21	9.79 888	28	10.20 112	9.92 755	8	49	
12	9.72 663	20	9.79 916	28	10.20 084	9.92 747	8	48	
13	9.72 683	20	9.79 944	28	10.20 056	9.92 739	8	47	
14	9.72 703	20	9.79 972	28	10.20 028	9.92 731	8	46	
15	9.72 723	20	9.80 000	28	10.20 000	9.92 723	8	45	
16	9.72 743	20	9.80 028	28	10.19 972	9.92 715	8	44	
17	9.72 763	20	9.80 056	28	10.19 944	9.92 707	8	43	
18	9.72 783	20	9.80 084	28	10.19 916	9.92 699	8	42	
19	9.72 803	20	9.80 112	28	10.19 888	9.92 691	8	41	
20	9.72 823	20	9.80 140	28	10.19 860	9.92 683	8	**40**	
21	9.72 843	20	9.80 168	28	10.19 832	9.92 675	8	39	
22	9.72 863	20	9.80 195	27	10.19 805	9.92 667	8	38	
23	9.72 883	20	9.80 223	28	10.19 777	9.92 659	8	37	
24	9.72 902	19	9.80 251	28	10.19 749	9.92 651	8	36	
25	9.72 922	20	9.80 279	28	10.19 721	9.92 643	8	35	
26	9.72 942	20	9.80 307	28	10.19 693	9.92 635	8	34	
27	9.72 962	20	9.80 335	28	10.19 665	9.92 627	8	33	
28	9.72 982	20	9.80 363	28	10.19 637	9.92 619	8	32	
29	9.73 002	20	9.80 391	28	10.19 609	9.92 611	8	31	
30	9.73 022	20	9.80 419	28	10.19 581	9.92 603	8	**30**	
31	9.73 041	19	9.80 447	28	10.19 553	9.92 595	8	29	
32	9.73 061	20	9.80 474	27	10.19 526	9.92 587	8	28	
33	9.73 081	20	9.80 502	28	10.19 498	9.92 579	8	27	
34	9.73 101	20	9.80 530	28	10.19 470	9.92 571	8	26	
35	9.73 121	20	9.80 558	28	10.19 442	9.92 563	8	25	
36	9.73 140	19	9.80 586	28	10.19 414	9.92 555	8	24	
37	9.73 160	20	9.80 614	28	10.19 386	9.92 546	9	23	
38	9.73 180	20	9.80 642	28	10.19 358	9.92 538	8	22	
39	9.73 200	20	9.80 669	27	10.19 331	9.92 530	8	21	
40	9.73 219	19	9.80 697	28	10.19 303	9.92 522	8	**20**	
41	9.73 239	20	9.80 725	28	10.19 275	9.92 514	8	19	
42	9.73 259	20	9.80 753	28	10.19 247	9.92 506	8	18	
43	9.73 278	19	9.80 781	28	10.19 219	9.92 498	8	17	
44	9.73 298	20	9.80 808	27	10.19 192	9.92 490	8	16	
45	9.73 318	20	9.80 836	28	10.19 164	9.92 482	8	15	
46	9.73 337	19	9.80 864	28	10.19 136	9.92 473	9	14	
47	9.73 357	20	9.80 892	28	10.19 108	9.92 465	8	13	
48	9.73 377	20	9.80 919	27	10.19 081	9.92 457	8	12	
49	9.73 396	19	9.80 947	28	10.19 053	9.92 449	8	11	
50	9.73 416	20	9.80 975	28	10.19 025	9.92 441	8	**10**	
51	9.73 435	19	9.81 003	28	10.18 997	9.92 433	8	9	
52	9.73 455	20	9.81 030	27	10.18 970	9.92 425	9	8	
53	9.73 474	19	9.81 058	28	10.18 942	9.92 416	8	7	
54	9.73 494	20	9.81 086	28	10.18 914	9.92 408	8	6	
55	9.73 513	19	9.81 113	27	10.18 887	9.92 400	8	5	
56	9.73 533	20	9.81 141	28	10.18 859	9.92 392	8	4	
57	9.73 552	19	9.81 169	28	10.18 831	9.92 384	8	3	
58	9.73 572	20	9.81 196	27	10.18 804	9.92 376	8	2	
59	9.73 591	19	9.81 224	28	10.18 776	9.92 367	9	1	
60	9.73 611	20	9.81 252	28	10.18 748	9.92 359	8	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	29	28	27
6	2.9	2.8	2.7
7	3.5	3.3	3.2
8	3.9	3.7	3.6
9	4.4	4.2	4.0
10	4.8	4.7	4.5
20	9.7	9.3	9.0
30	14.5	14.0	13.5
40	19.3	18.7	18.0
50	24.2	23.3	22.5

″	21	20	19
6	2.1	2.0	1.9
7	2.4	2.3	2.2
8	2.8	2.7	2.5
9	3.2	3.0	2.8
10	3.5	3.3	3.2
20	7.0	6.7	6.3
30	10.5	10.0	9.5
40	14.0	13.3	12.7
50	17.5	16.7	15.8

″	9	8	7
6	0.9	0.8	0.7
7	1.0	0.9	0.8
8	1.2	1.1	0.9
9	1.4	1.2	1.0
10	1.5	1.3	1.2
20	3.0	2.7	2.3
30	4.5	4.0	3.5
40	6.0	5.3	4.7
50	7.5	6.7	5.8

57°

33°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.73 611		9.81 252		10.18 748	9.92 359		**60**	
1	9.73 630	19	9.81 279	27	10.18 721	9.92 351	8	59	
2	9.73 650	20	9.81 307	28	10.18 693	9.92 343	8	58	
3	9.73 669	19	9.81 335	28	10.18 665	9.92 335	8	57	
4	9.73 689	20	9.81 362	27	10.18 638	9.92 326	9	56	
5	9.73 708	19	9.81 390	28	10.18 610	9.92 318	8	55	
6	9.73 727	19	9.81 418	28	10.18 582	9.92 310	8	54	
7	9.73 747	20	9.81 445	27	10.18 555	9.92 302	8	53	
8	9.73 766	19	9.81 473	28	10.18 527	9.92 293	9	52	
9	9.73 785	19	9.81 500	27	10.18 500	9.92 285	8	51	
10	9.73 805	20	9.81 528	28	10.18 472	9.92 277	8	**50**	
11	9.73 824	19	9.81 556	28	10.18 444	9.92 269	8	49	
12	9.73 843	19	9.81 583	27	10.18 417	9.92 260	9	48	
13	9.73 863	20	9.81 611	28	10.18 389	9.92 252	8	47	
14	9.73 882	19	9.81 638	27	10.18 362	9.92 244	8	46	
15	9.73 901	19	9.81 666	28	10.18 334	9.92 235	9	45	
16	9.73 921	20	9.81 693	27	10.18 307	9.92 227	8	44	
17	9.73 940	19	9.81 721	28	10.18 279	9.92 219	8	43	
18	9.73 959	19	9.81 748	27	10.18 252	9.92 211	8	42	
19	9.73 978	19	9.81 776	28	10.18 224	9.92 202	9	41	
20	9.73 997	19	9.81 803	27	10.18 197	9.92 194	8	**40**	
21	9.74 017	20	9.81 831	28	10.18 169	9.92 186	8	39	
22	9.74 036	19	9.81 858	27	10.18 142	9.92 177	9	38	
23	9.74 055	19	9.81 886	28	10.18 114	9.92 169	8	37	
24	9.74 074	19	9.81 913	27	10.18 087	9.92 161	8	36	
25	9.74 093	19	9.81 941	28	10.18 059	9.92 152	9	35	
26	9.74 113	20	9.81 968	27	10.18 032	9.92 144	8	34	
27	9.74 132	19	9.81 996	28	10.18 004	9.92 136	8	33	
28	9.74 151	19	9.82 023	27	10.17 977	9.92 127	9	32	
29	9.74 170	19	9.82 051	28	10.17 949	9.92 119	8	31	
30	9.74 189	19	9.82 078	27	10.17 922	9.92 111	8	**30**	
31	9.74 208	19	9.82 106	28	10.17 894	9.92 102	9	29	
32	9.74 227	19	9.82 133	27	10.17 867	9.92 094	8	28	
33	9.74 246	19	9.82 161	28	10.17 839	9.92 086	8	27	
34	9.74 265	19	9.82 188	27	10.17 812	9.92 077	9	26	
35	9.74 284	19	9.82 215	27	10.17 785	9.92 069	8	25	
36	9.74 303	19	9.82 243	28	10.17 757	9.92 060	9	24	
37	9.74 322	19	9.82 270	27	10.17 730	9.92 052	8	23	
38	9.74 341	19	9.82 298	28	10.17 702	9.92 044	8	22	
39	9.74 360	19	9.82 325	27	10.17 675	9.92 035	9	21	
40	9.74 379	19	9.82 352	27	10.17 648	9.92 027	8	**20**	
41	9.74 398	19	9.82 380	28	10.17 620	9.92 018	9	19	
42	9.74 417	19	9.82 407	27	10.17 593	9.92 010	8	18	
43	9.74 436	19	9.82 435	28	10.17 565	9.92 002	8	17	
44	9.74 455	19	9.82 462	27	10.17 538	9.91 993	9	16	
45	9.74 474	19	9.82 489	27	10.17 511	9.91 985	8	15	
46	9.74 493	19	9.82 517	28	10.17 483	9.91 976	9	14	
47	9.74 512	19	9.82 544	27	10.17 456	9.91 968	8	13	
48	9.74 531	19	9.82 571	27	10.17 429	9.91 959	9	12	
49	9.74 549	18	9.82 599	28	10.17 401	9.91 951	8	11	
50	9.74 568	19	9.82 626	27	10.17 374	9.91 942	9	**10**	
51	9.74 587	19	9.82 653	27	10.17 347	9.91 934	8	9	
52	9.74 606	19	9.82 681	28	10.17 319	9.91 925	9	8	
53	9.74 625	19	9.82 708	27	10.17 292	9.91 917	8	7	
54	9.74 644	19	9.82 735	27	10.17 265	9.91 908	9	6	
55	9.74 662	18	9.82 762	27	10.17 238	9.91 900	8	5	
56	9.74 681	19	9.82 790	28	10.17 210	9.91 891	9	4	
57	9.74 700	19	9.82 817	27	10.17 183	9.91 883	8	3	
58	9.74 719	19	9.82 844	27	10.17 156	9.91 874	9	2	
59	9.74 737	18	9.82 871	27	10.17 129	9.91 866	8	1	
60	9.74 756	19	9.82 899	28	10.17 101	9.91 857	9	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	28	27	20
6	2.8	2.7	2.0
7	3.3	3.2	2.3
8	3.7	3.6	2.7
9	4.2	4.0	3.0
10	4.7	4.5	3.3
20	9.3	9.0	6.7
30	14.0	13.5	10.0
40	18.7	18.0	13.3
50	23.3	22.5	16.7

″	19	18
6	1.9	1.8
7	2.2	2.1
8	2.5	2.4
9	2.9	2.7
10	3.2	3.0
20	6.3	6.0
30	9.5	9.0
40	12.7	12.0
50	15.8	15.0

″	9	8
6	0.9	0.8
7	1.0	0.9
8	1.2	1.1
9	1.4	1.2
10	1.5	1.3
20	3.0	2.7
30	4.5	4.0
40	6.0	5.3
50	7.5	6.7

56°

34°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.74 756		9.82 899		10.17 101	9.91 857		**60**	
1	9.74 775	19	9.82 926	27	10.17 074	9.91 849	8	59	
2	9.74 794	19	9.82 953	27	10.17 047	9.91 840	9	58	
3	9.74 812	18	9.82 980	27	10.17 020	9.91 832	8	57	
4	9.74 831	19	9.83 008	28	10.16 992	9.91 823	9	56	
5	9.74 850	19	9.83 035	27	10.16 965	9.91 815	8	55	
6	9.74 868	18	9.83 062	27	10.16 938	9.91 806	9	54	
7	9.74 887	19	9.83 089	27	10.16 911	9.91 798	8	53	
8	9.74 906	19	9.83 117	28	10.16 883	9.91 789	9	52	
9	9.74 924	18	9.83 144	27	10.16 856	9.91 781	8	51	
10	9.74 943	19	9.83 171	27	10.16 829	9.91 772	9	**50**	
11	9.74 961	18	9.83 198	27	10.16 802	9.91 763	9	49	
12	9.74 980	19	9.83 225	27	10.16 775	9.91 755	8	48	
13	9.74 999	19	9.83 252	28	10.16 748	9.91 746	9	47	
14	9.75 017	18	9.83 280	27	10.16 720	9.91 738	8	46	
15	9.75 036	19	9.83 307	27	10.16 693	9.91 729	9	45	
16	9.75 054	18	9.83 334	27	10.16 666	9.91 720	9	44	
17	9.75 073	19	9.83 361	27	10.16 639	9.91 712	8	43	
18	9.75 091	18	9.83 388	27	10.16 612	9.91 703	9	42	
19	9.75 110	19	9.83 415	27	10.16 585	9.91 695	8	41	
20	9.75 128	18	9.83 442	27	10.16 558	9.91 686	9	**40**	
21	9.75 147	19	9.83 470	28	10.16 530	9.91 677	9	39	
22	9.75 165	18	9.83 497	27	10.16 503	9.91 669	8	38	
23	9.75 184	19	9.83 524	27	10.16 476	9.91 660	9	37	
24	9.75 202	18	9.83 551	27	10.16 449	9.91 651	9	36	
25	9.75 221	19	9.83 578	27	10.16 422	9.91 643	8	35	
26	9.75 239	18	9.83 605	27	10.16 395	9.91 634	9	34	
27	9.75 258	19	9.83 632	27	10.16 368	9.91 625	9	33	
28	9.75 276	18	9.83 659	27	10.16 341	9.91 617	8	32	
29	9.75 294	18	9.83 686	27	10.16 314	9.91 608	9	31	
30	9.75 313	19	9.83 713	27	10.16 287	9.91 599	9	**30**	
31	9.75 331	18	9.83 740	27	10.16 260	9.91 591	8	29	
32	9.75 350	19	9.83 768	28	10.16 232	9.91 582	9	28	
33	9.75 368	18	9.83 795	27	10.16 205	9.91 573	9	27	
34	9.75 386	18	9.83 822	27	10.16 178	9.91 565	8	26	
35	9.75 405	19	9.83 849	27	10.16 151	9.91 556	9	25	
36	9.75 423	18	9.83 876	27	10.16 124	9.91 547	9	24	
37	9.75 441	18	9.83 903	27	10.16 097	9.91 538	9	23	
38	9.75 459	18	9.83 930	27	10.16 070	9.91 530	8	22	
39	9.75 478	19	9.83 957	27	10.16 043	9.91 521	9	21	
40	9.75 496	18	9.83 984	27	10.16 016	9.91 512	9	**20**	
41	9.75 514	18	9.84 011	27	10.15 989	9.91 504	8	19	
42	9.75 533	19	9.84 038	27	10.15 962	9.91 495	9	18	
43	9.75 551	18	9.84 065	27	10.15 935	9.91 486	9	17	
44	9.75 569	18	9.84 092	27	10.15 908	9.91 477	9	16	
45	9.75 587	18	9.84 119	27	10.15 881	9.91 469	8	15	
46	9.75 605	18	9.84 146	27	10.15 854	9.91 460	9	14	
47	9.75 624	19	9.84 173	27	10.15 827	9.91 451	9	13	
48	9.75 642	18	9.84 200	27	10.15 800	9.91 442	9	12	
49	9.75 660	18	9.84 227	27	10.15 773	9.91 433	9	11	
50	9.75 678	18	9.84 254	27	10.15 746	9.91 425	8	**10**	
51	9.75 696	18	9.84 280	26	10.15 720	9.91 416	9	9	
52	9.75 714	18	9.84 307	27	10.15 693	9.91 407	9	8	
53	9.75 733	19	9.84 334	27	10.15 666	9.91 398	9	7	
54	9.75 751	18	9.84 361	27	10.15 639	9.91 389	9	6	
55	9.75 769	18	9.84 388	27	10.15 612	9.91 381	8	5	
56	9.75 787	18	9.84 415	27	10.15 585	9.91 372	9	4	
57	9.75 805	18	9.84 442	27	10.15 558	9.91 363	9	3	
58	9.75 823	18	9.84 469	27	10.15 531	9.91 354	9	2	
59	9.75 841	18	9.84 496	27	10.15 504	9.91 345	9	1	
60	9.75 859		9.84 523		10.15 477	9.91 336		**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	28	27	26
6	2.8	2.7	2.6
7	3.3	3.2	3.0
8	3.7	3.6	3.5
9	4.2	4.0	3.9
10	4.7	4.5	4.3
20	9.3	9.0	8.7
30	14.0	13.5	13.0
40	18.7	18.0	17.3
50	23.3	22.5	21.7

″	19	18
6	1.9	1.8
7	2.2	2.1
8	2.5	2.4
9	2.8	2.7
10	3.2	3.0
20	6.3	6.0
30	9.5	9.0
40	12.7	12.0
50	15.8	15.0

″	9	8
6	0.9	0.8
7	1.0	0.9
8	1.2	1.1
9	1.4	1.2
10	1.5	1.3
20	3.0	2.7
30	4.5	4.0
40	6.0	5.3
50	7.5	6.7

55°

35°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.75 859		9.84 523		10.15 477	9.91 336		**60**	
1	9.75 877	18	9.84 550	27	10.15 450	9.91 328	8	59	
2	9.75 895	18	9.84 576	26	10.15 424	9.91 319	9	58	
3	9.75 913	18	9.84 603	27	10.15 397	9.91 310	9	57	
4	9.75 931	18	9.84 630	27	10.15 370	9.91 301	9	56	
5	9.75 949	18	9.84 657	27	10.15 343	9.91 292	9	55	
6	9.75 967	18	9.84 684	27	10.15 316	9.91 283	9	54	
7	9.75 985	18	9.84 711	27	10.15 289	9.91 274	9	53	
8	9.76 003	18	9.84 738	27	10.15 262	9.91 266	8	52	
9	9.76 021	18	9.84 764	26	10.15 236	9.91 257	9	51	
10	9.76 039	18	9.84 791	27	10.15 209	9.91 248	9	**50**	
11	9.76 057	18	9.84 818	27	10.15 182	9.91 239	9	49	
12	9.76 075	18	9.84 845	27	10.15 155	9.91 230	9	48	
13	9.76 093	18	9.84 872	27	10.15 128	9.91 221	9	47	
14	9.76 111	18	9.84 899	27	10.15 101	9.91 212	9	46	
15	9.76 129	18	9.84 925	26	10.15 075	9.91 203	9	45	
16	9.76 146	17	9.84 952	27	10.15 048	9.91 194	9	44	
17	9.76 164	18	9.84 979	27	10.15 021	9.91 185	9	43	
18	9.76 182	18	9.85 006	27	10.14 994	9.91 176	9	42	
19	9.76 200	18	9.85 033	27	10.14 967	9.91 167	9	41	
20	9.76 218	18	9.85 059	26	10.14 941	9.91 158	9	**40**	
21	9.76 236	18	9.85 086	27	10.14 914	9.91 149	9	39	
22	9.76 253	17	9.85 113	27	10.14 887	9.91 141	8	38	
23	9.76 271	18	9.85 140	27	10.14 860	9.91 132	9	37	
24	9.76 289	18	9.85 166	26	10.14 834	9.91 123	9	36	
25	9.76 307	18	9.85 193	27	10.14 807	9.91 114	9	35	
26	9.76 324	17	9.85 220	27	10.14 780	9.91 105	9	34	
27	9.76 342	18	9.85 247	27	10.14 753	9.91 096	9	33	
28	9.76 360	18	9.85 273	26	10.14 727	9.91 087	9	32	
29	9.76 378	18	9.85 300	27	10.14 700	9.91 078	9	31	
30	9.76 395	17	9.85 327	27	10.14 673	9.91 069	9	**30**	
31	9.76 413	18	9.85 354	27	10.14 646	9.91 060	9	29	
32	9.76 431	18	9.85 380	26	10.14 620	9.91 051	9	28	
33	9.76 448	17	9.85 407	27	10.14 593	9.91 042	9	27	
34	9.76 466	18	9.85 434	27	10.14 566	9.91 033	9	26	
35	9.76 484	18	9.85 460	26	10.14 540	9.91 023	10	25	
36	9.76 501	17	9.85 487	27	10.14 513	9.91 014	9	24	
37	9.76 519	18	9.85 514	27	10.14 486	9.91 005	9	23	
38	9.76 537	18	9.85 540	26	10.14 460	9.90 996	9	22	
39	9.76 554	17	9.85 567	27	10.14 433	9.90 987	9	21	
40	9.76 572	18	9.85 594	27	10.14 406	9.90 978	9	**20**	
41	9.76 590	18	9.85 620	26	10.14 380	9.90 969	9	19	
42	9.76 607	17	9.85 647	27	10.14 353	9.90 960	9	18	
43	9.76 625	18	9.85 674	27	10.14 326	9.90 951	9	17	
44	9.76 642	17	9.85 700	26	10.14 300	9.90 942	9	16	
45	9.76 660	18	9.85 727	27	10.14 273	9.90 933	9	15	
46	9.76 677	17	9.85 754	27	10.14 246	9.90 924	9	14	
47	9.76 695	18	9.85 780	26	10.14 220	9.90 915	9	13	
48	9.76 712	17	9.85 807	27	10.14 193	9.90 906	9	12	
49	9.76 730	18	9.85 834	27	10.14 166	9.90 896	10	11	
50	9.76 747	17	9.85 860	26	10.14 140	9.90 887	9	**10**	
51	9.76 765	18	9.85 887	27	10.14 113	9.90 878	9	9	
52	9.76 782	17	9.85 913	26	10.14 087	9.90 869	9	8	
53	9.76 800	18	9.85 940	27	10.14 060	9.90 860	9	7	
54	9.76 817	17	9.85 967	27	10.14 033	9.90 851	9	6	
55	9.76 835	18	9.85 993	26	10.14 007	9.90 842	9	5	
56	9.76 852	17	9.86 020	27	10.13 980	9.90 832	10	4	
57	9.76 870	18	9.86 046	26	10.13 954	9.90 823	9	3	
58	9.76 887	17	9.86 073	27	10.13 927	9.90 814	9	2	
59	9.76 904	17	9.86 100	27	10.13 900	9.90 805	9	1	
60	9.76 922	18	9.86 126	26	10.13 874	9.90 796	9	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	27	26	18
6	2.7	2.6	1.8
7	3.2	3.0	2.1
8	3.6	3.5	2.4
9	4.0	3.9	2.7
10	4.5	4.3	3.0
20	9.0	8.7	6.0
30	13.5	13.0	9.0
40	18.0	17.3	12.0
50	22.5	21.7	15.0

″	17	10
6	1.7	1.0
7	2.0	1.2
8	2.3	1.3
9	2.6	1.5
10	2.8	1.7
20	5.7	3.3
30	8.5	5.0
40	11.3	6.7
50	14.2	8.3

″	9	8
6	0.9	0.8
7	1.0	0.9
8	1.2	1.1
9	1.4	1.2
10	1.5	1.3
20	3.0	2.7
30	4.5	4.0
40	6.0	5.3
50	7.5	6.7

54°

36°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.76 922		9.86 126		10.13 874	9.90 796		**60**	
1	9.76 939	17	9.86 153	27	10.13 847	9.90 787	9	59	
2	9.76 957	18	9.86 179	26	10.13 821	9.90 777	10	58	
3	9.76 974	17	9.86 206	27	10.13 794	9.90 768	9	57	
4	9.76 991	17	9.86 232	26	10.13 768	9.90 759	9	56	
5	9.77 009	18	9.86 259	27	10.13 741	9.90 750	9	55	
6	9.77 026	17	9.86 285	26	10.13 715	9.90 741	9	54	
7	9.77 043	17	9.86 312	27	10.13 688	9.90 731	10	53	
8	9.77 061	18	9.86 338	26	10.13 662	9.90 722	9	52	
9	9.77 078	17	9.86 365	27	10.13 635	9.90 713	9	51	
10	9.77 095	17	9.86 392	27	10.13 608	9.90 704	9	**50**	
11	9.77 112	17	9.86 418	26	10.13 582	9.90 694	10	49	
12	9.77 130	18	9.86 445	27	10.13 555	9.90 685	9	48	
13	9.77 147	17	9.86 471	26	10.13 529	9.90 676	9	47	
14	9.77 164	17	9.86 498	27	10.13 502	9.90 667	9	46	
15	9.77 181	17	9.86 524	26	10.13 476	9.90 657	10	45	
16	9.77 199	18	9.86 551	27	10.13 449	9.90 648	9	44	
17	9.77 216	17	9.86 577	26	10.13 423	9.90 639	9	43	
18	9.77 233	17	9.86 603	26	10.13 397	9.90 630	9	42	
19	9.77 250	17	9.86 630	27	10.13 370	9.90 620	10	41	
20	9.77 268	18	9.86 656	26	10.13 344	9.90 611	9	**40**	
21	9.77 285	17	9.86 683	27	10.13 317	9.90 602	9	39	
22	9.77 302	17	9.86 709	26	10.13 291	9.90 592	10	38	
23	9.77 319	17	9.86 736	27	10.13 264	9.90 583	9	37	
24	9.77 336	17	9.86 762	26	10.13 238	9.90 574	9	36	
25	9.77 353	17	9.86 789	27	10.13 211	9.90 565	9	35	
26	9.77 370	17	9.86 815	26	10.13 185	9.90 555	10	34	
27	9.77 387	17	9.86 842	27	10.13 158	9.90 546	9	33	
28	9.77 405	18	9.86 868	26	10.13 132	9.90 537	9	32	
29	9.77 422	17	9.86 894	26	10.13 106	9.90 527	10	31	
30	9.77 439	17	9.86 921	27	10.13 079	9.90 518	9	**30**	
31	9.77 456	17	9.86 947	26	10.13 053	9.90 509	9	29	
32	9.77 473	17	9.86 974	27	10.13 026	9.90 499	10	28	
33	9.77 490	17	9.87 000	26	10.13 000	9.90 490	9	27	
34	9.77 507	17	9.87 027	27	10.12 973	9.90 480	10	26	
35	9.77 524	17	9.87 053	26	10.12 947	9.90 471	9	25	
36	9.77 541	17	9.87 079	26	10.12 921	9.90 462	9	24	
37	9.77 558	17	9.87 106	27	10.12 894	9.90 452	10	23	
38	9.77 575	17	9.87 132	26	10.12 868	9.90 443	9	22	
39	9.77 592	17	9.87 158	26	10.12 842	9.90 434	9	21	
40	9.77 609	17	9.87 185	27	10.12 815	9.90 424	10	**20**	
41	9.77 626	17	9.87 211	26	10.12 789	9.90 415	9	19	
42	9.77 643	17	9.87 238	27	10.12 762	9.90 405	10	18	
43	9.77 660	17	9.87 264	26	10.12 736	9.90 396	9	17	
44	9.77 677	17	9.87 290	26	10.12 710	9.90 386	10	16	
45	9.77 694	17	9.87 317	27	10.12 683	9.90 377	9	15	
46	9.77 711	17	9.87 343	26	10.12 657	9.90 368	9	14	
47	9.77 728	17	9.87 369	26	10.12 631	9.90 358	10	13	
48	9.77 744	16	9.87 396	27	10.12 604	9.90 349	9	12	
49	9.77 761	17	9.87 422	26	10.12 578	9.90 339	10	11	
50	9.77 778	17	9.87 448	26	10.12 552	9.90 330	9	**10**	
51	9.77 795	17	9.87 475	27	10.12 525	9.90 320	10	9	
52	9.77 812	17	9.87 501	26	10.12 499	9.90 311	9	8	
53	9.77 829	17	9.87 527	26	10.12 473	9.90 301	10	7	
54	9.77 846	17	9.87 554	27	10.12 446	9.90 292	9	6	
55	9.77 862	16	9.87 580	26	10.12 420	9.90 282	10	5	
56	9.77 879	17	9.87 606	26	10.12 394	9.90 273	9	4	
57	9.77 896	17	9.87 633	27	10.12 367	9.90 263	10	3	
58	9.77 913	17	9.87 659	26	10.12 341	9.90 254	9	2	
59	9.77 930	17	9.87 685	26	10.12 315	9.90 244	10	1	
60	9.77 946	16	9.87 711	26	10.12 289	9.90 235	9	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	27	26	18
6	2.7	2.6	1.8
7	3.2	3.0	2.1
8	3.6	3.5	2.4
9	4.0	3.9	2.7
10	4.5	4.3	3.0
20	9.0	8.7	6.0
30	13.5	13.0	9.0
40	18.0	17.3	12.0
50	22.5	21.7	15.0

″	17	16
6	1.7	1.6
7	2.0	1.9
8	2.3	2.1
9	2.6	2.4
10	2.8	2.7
20	5.7	5.3
30	8.5	8.0
40	11.3	10.7
50	14.2	13.3

″	10	9
6	1.0	0.9
7	1.2	1.0
8	1.3	1.2
9	1.5	1.4
10	1.7	1.5
20	3.3	3.0
30	5.0	4.5
40	6.7	6.0
50	8.3	7.5

53°

37°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.77 946		9.87 711		10.12 289	9.90 235		**60**	
1	9.77 963	17	9.87 738	27	10.12 262	9.90 225	10	59	
2	9.77 980	17	9.87 764	26	10.12 236	9.90 216	9	58	
3	9.77 997	17	9.87 790	26	10.12 210	9.90 206	10	57	
4	9.78 013	16	9.87 817	27	10.12 183	9.90 197	9	56	
5	9.78 030	17	9.87 843	26	10.12 157	9.90 187	10	55	
6	9.78 047	17	9.87 869	26	10.12 131	9.90 178	9	54	
7	9.78 063	16	9.87 895	26	10.12 105	9.90 168	10	53	
8	9.78 080	17	9.87 922	27	10.12 078	9.90 159	9	52	
9	9.78 097	17	9.87 948	26	10.12 052	9.90 149	10	51	
10	9.78 113	16	9.87 974	26	10.12 026	9.90 139	10	**50**	
11	9.78 130	17	9.88 000	26	10.12 000	9.90 130	9	49	
12	9.78 147	17	9.88 027	27	10.11 973	9.90 120	10	48	
13	9.78 163	16	9.88 053	26	10.11 947	9.90 111	9	47	
14	9.78 180	17	9.88 079	26	10.11 921	9.90 101	10	46	
15	9.78 197	17	9.88 105	26	10.11 895	9.90 091	10	45	
16	9.78 213	16	9.88 131	26	10.11 869	9.90 082	9	44	
17	9.78 230	17	9.88 158	27	10.11 842	9.90 072	10	43	
18	9.78 246	16	9.88 184	26	10.11 816	9.90 063	9	42	
19	9.78 263	17	9.88 210	26	10.11 790	9.90 053	10	41	
20	9.78 280	17	9.88 236	26	10.11 764	9.90 043	10	**40**	
21	9.78 296	16	9.88 262	26	10.11 738	9.90 034	9	39	
22	9.78 313	17	9.88 289	27	10.11 711	9.90 024	10	38	
23	9.78 329	16	9.88 315	26	10.11 685	9.90 014	10	37	
24	9.78 346	17	9.88 341	26	10.11 659	9.90 005	9	36	
25	9.78 362	16	9.88 367	26	10.11 633	9.89 995	10	35	
26	9.78 379	17	9.88 393	26	10.11 607	9.89 985	10	34	
27	9.78 395	16	9.88 420	27	10.11 580	9.89 976	9	33	
28	9.78 412	17	9.88 446	26	10.11 554	9.89 966	10	32	
29	9.78 428	16	9.88 472	26	10.11 528	9.89 956	10	31	
30	9.78 445	17	9.88 498	26	10.11 502	9.89 947	9	**30**	
31	9.78 461	16	9.88 524	26	10.11 476	9.89 937	10	29	
32	9.78 478	17	9.88 550	26	10.11 450	9.89 927	10	28	
33	9.78 494	16	9.88 577	27	10.11 423	9.89 918	9	27	
34	9.78 510	16	9.88 603	26	10.11 397	9.89 908	10	26	
35	9.78 527	17	9.88 629	26	10.11 371	9.89 898	10	25	
36	9.78 543	16	9.88 655	26	10.11 345	9.89 888	10	24	
37	9.78 560	17	9.88 681	26	10.11 319	9.89 879	9	23	
38	9.78 576	16	9.88 707	26	10.11 293	9.89 869	10	22	
39	9.78 592	16	9.88 733	26	10.11 267	9.89 859	10	21	
40	9.78 609	17	9.88 759	26	10.11 241	9.89 849	10	**20**	
41	9.78 625	16	9.88 786	27	10.11 214	9.89 840	9	19	
42	9.78 642	17	9.88 812	26	10.11 188	9.89 830	10	18	
43	9.78 658	16	9.88 838	26	10.11 162	9.89 820	10	17	
44	9.78 674	16	9.88 864	26	10.11 136	9.89 810	10	16	
45	9.78 691	17	9.88 890	26	10.11 110	9.89 801	9	15	
46	9.78 707	16	9.88 916	26	10.11 084	9.89 791	10	14	
47	9.78 723	16	9.88 942	26	10.11 058	9.89 781	10	13	
48	9.78 739	16	9.88 968	26	10.11 032	9.89 771	10	12	
49	9.78 756	17	9.88 994	26	10.11 006	9.89 761	10	11	
50	9.78 772	16	9.89 020	26	10.10 980	9.89 752	9	**10**	
51	9.78 788	16	9.89 046	26	10.10 954	9.89 742	10	9	
52	9.78 805	17	9.89 073	27	10.10 927	9.89 732	10	8	
53	9.78 821	16	9.89 099	26	10.10 901	9.89 722	10	7	
54	9.78 837	16	9.89 125	26	10.10 875	9.89 712	10	6	
55	9.78 853	16	9.89 151	26	10.10 849	9.89 702	10	5	
56	9.78 869	16	9.89 177	26	10.10 823	9.89 693	9	4	
57	9.78 886	17	9.89 203	26	10.10 797	9.89 683	10	3	
58	9.78 902	16	9.89 229	26	10.10 771	9.89 673	10	2	
59	9.78 918	16	9.89 255	26	10.10 745	9.89 663	10	1	
60	9.78 934	16	9.89 281	26	10.10 719	9.89 653	10	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	27	26	17
6	2.7	2.6	1.7
7	3.2	3.0	2.0
8	3.6	3.5	2.3
9	4.0	3.9	2.6
10	4.5	4.3	2.8
20	9.0	8.7	5.7
30	13.5	13.0	8.5
40	18.0	17.3	11.3
50	22.5	21.7	14.2

″	16	10	9
6	1.6	1.0	0.9
7	1.9	1.2	1.0
8	2.1	1.3	1.2
9	2.4	1.5	1.4
10	2.7	1.7	1.5
20	5.3	3.3	3.0
30	8.0	5.0	4.5
40	10.7	6.7	6.0
50	13.3	8.3	7.5

52°

38°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.78 934		9.89 281		10.10 719	9.89 653		**60**	
1	9.78 950	16	9.89 307	26	10.10 693	9.89 643	10	59	
2	9.78 967	17	9.89 333	26	10.10 667	9.89 633	10	58	
3	9.78 983	16	9.89 359	26	10.10 641	9.89 624	9	57	
4	9.78 999	16	9.89 385	26	10.10 615	9.89 614	10	56	
5	9.79 015	16	9.89 411	26	10.10 589	9.89 604	10	55	″ | **26** | **25**
6	9.79 031	16	9.89 437	26	10.10 563	9.89 594	10	54	
7	9.79 047	16	9.89 463	26	10.10 537	9.89 584	10	53	6 | 2.6 | 2.5
8	9.79 063	16	9.89 489	26	10.10 511	9.89 574	10	52	7 | 3.0 | 2.9
9	9.79 079	16	9.89 515	26	10.10 485	9.89 564	10	51	8 | 3.5 | 3.3
10	9.79 095	16	9.89 541	26	10.10 459	9.89 554	10	**50**	9 | 3.9 | 3.8
11	9.79 111	16	9.89 567	26	10.10 433	9.89 544	10	49	10 | 4.3 | 4.2
12	9.79 128	17	9.89 593	26	10.10 407	9.89 534	10	48	20 | 8.7 | 8.3
13	9.79 144	16	9.89 619	26	10.10 381	9.89 524	10	47	30 | 13.0 | 12.5
14	9.79 160	16	9.89 645	26	10.10 355	9.89 514	10	46	40 | 17.3 | 16.7
15	9.79 176	16	9.89 671	26	10.10 329	9.89 504	10	45	50 | 21.7 | 20.8
16	9.79 192	16	9.89 697	26	10.10 303	9.89 495	9	44	
17	9.79 208	16	9.89 723	26	10.10 277	9.89 485	10	43	
18	9.79 224	16	9.89 749	26	10.10 251	9.89 475	10	42	
19	9.79 240	16	9.89 775	26	10.10 225	9.89 465	10	41	
20	9.79 256	16	9.89 801	26	10.10 199	9.89 455	10	**40**	″ | **17** | **16**
21	9.79 272	16	9.89 827	26	10.10 173	9.89 445	10	39	
22	9.79 288	16	9.89 853	26	10.10 147	9.89 435	10	38	6 | 1.7 | 1.6
23	9.79 304	16	9.89 879	26	10.10 121	9.89 425	10	37	7 | 2.0 | 1.9
24	9.79 319	15	9.89 905	26	10.10 095	9.89 415	10	36	8 | 2.3 | 2.1
25	9.79 335	16	9.89 931	26	10.10 069	9.89 405	10	35	9 | 2.6 | 2.4
26	9.79 351	16	9.89 957	26	10.10 043	9.89 395	10	34	10 | 2.8 | 2.7
27	9.79 367	16	9.89 983	26	10.10 017	9.89 385	10	33	20 | 5.7 | 5.3
28	9.79 383	16	9.90 009	26	10.09 991	9.89 375	10	32	30 | 8.5 | 8.0
29	9.79 399	16	9.90 035	26	10.09 965	9.89 364	11	31	40 | 11.3 | 10.7
30	9.79 415	16	9.90 061	26	10.09 939	9.89 354	10	**30**	50 | 14.2 | 13.3
31	9.79 431	16	9.90 086	25	10.09 914	9.89 344	10	29	
32	9.79 447	16	9.90 112	26	10.09 888	9.89 334	10	28	
33	9.79 463	16	9.90 138	26	10.09 862	9.89 324	10	27	
34	9.79 478	15	9.90 164	26	10.09 836	9.89 314	10	26	″ | **15** | **11**
35	9.79 494	16	9.90 190	26	10.09 810	9.89 304	10	25	
36	9.79 510	16	9.90 216	26	10.09 784	9.89 294	10	24	6 | 1.5 | 1.1
37	9.79 526	16	9.90 242	26	10.09 758	9.89 284	10	23	7 | 1.8 | 1.3
38	9.79 542	16	9.90 268	26	10.09 732	9.89 274	10	22	8 | 2.0 | 1.5
39	9.79 558	16	9.90 294	26	10.09 706	9.89 264	10	21	9 | 2.2 | 1.6
40	9.79 573	15	9.90 320	26	10.09 680	9.89 254	10	**20**	10 | 2.5 | 1.8
41	9.79 589	16	9.90 346	26	10.09 654	9.89 244	10	19	20 | 5.0 | 3.7
42	9.79 605	16	9.90 371	25	10.09 629	9.89 233	11	18	30 | 7.5 | 5.5
43	9.79 621	16	9.90 397	26	10.09 603	9.89 223	10	17	40 | 10.0 | 7.3
44	9.79 636	15	9.90 423	26	10.09 577	9.89 213	10	16	50 | 12.5 | 9.2
45	9.79 652	16	9.90 449	26	10.09 551	9.89 203	10	15	
46	9.79 668	16	9.90 475	26	10.09 525	9.89 193	10	14	
47	9.79 684	16	9.90 501	26	10.09 499	9.89 183	10	13	
48	9.79 699	15	9.90 527	26	10.09 473	9.89 173	10	12	″ | **10** | **9**
49	9.79 715	16	9.90 553	26	10.09 447	9.89 162	11	11	
50	9.79 731	16	9.90 578	25	10.09 422	9.89 152	10	**10**	6 | 1.0 | 0.9
51	9.79 746	15	9.90 604	26	10.09 396	9.89 142	10	9	7 | 1.2 | 1.0
52	9.79 762	16	9.90 630	26	10.09 370	9.89 132	10	8	8 | 1.3 | 1.2
53	9.79 778	16	9.90 656	26	10.09 344	9.89 122	10	7	9 | 1.5 | 1.4
54	9.79 793	15	9.90 682	26	10.09 318	9.89 112	10	6	10 | 1.7 | 1.5
55	9.79 809	16	9.90 708	26	10.09 292	9.89 101	11	5	20 | 3.3 | 3.0
56	9.79 825	16	9.90 734	26	10.09 266	9.89 091	10	4	30 | 5.0 | 4.5
57	9.79 840	15	9.90 759	25	10.09 241	9.89 081	10	3	40 | 6.7 | 6.0
58	9.79 856	16	9.90 785	26	10.09 215	9.89 071	10	2	50 | 8.3 | 7.5
59	9.79 872	16	9.90 811	26	10.09 189	9.89 060	11	1	
60	9.79 887	15	9.90 837	26	10.09 163	9.89 050	10	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

51°

39°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.79 887		9.90 837		10.09 163	9.89 050		**60**	
1	9.79 903	16	9.90 863	26	10.09 137	9.89 040	10	59	
2	9.79 918	15	9.90 889	26	10.09 111	9.89 030	10	58	
3	9.79 934	16	9.90 914	25	10.09 086	9.89 020	10	57	
4	9.79 950	16	9.90 940	26	10.09 060	9.89 009	11	56	
5	9.79 965	15	9.90 966	26	10.09 034	9.88 999	10	55	
6	9.79 981	16	9.90 992	26	10.09 008	9.88 989	10	54	
7	9.79 996	15	9.91 018	26	10.08 982	9.88 978	11	53	
8	9.80 012	16	9.91 043	25	10.08 957	9.88 968	10	52	
9	9.80 027	15	9.91 069	26	10.08 931	9.88 958	10	51	
10	9.80 043	16	9.91 095	26	10.08 905	9.88 948	10	**50**	
11	9.80 058	15	9.91 121	26	10.08 879	9.88 937	11	49	
12	9.80 074	16	9.91 147	26	10.08 853	9.88 927	10	48	
13	9.80 089	15	9.91 172	25	10.08 828	9.88 917	10	47	
14	9.80 105	16	9.91 198	26	10.08 802	9.88 906	11	46	
15	9.80 120	15	9.91 224	26	10.08 776	9.88 896	10	45	
16	9.80 136	16	9.91 250	26	10.08 750	9.88 886	10	44	
17	9.80 151	15	9.91 276	26	10.08 724	9.88 875	11	43	
18	9.80 166	15	9.91 301	25	10.08 699	9.88 865	10	42	
19	9.80 182	16	9.91 327	26	10.08 673	9.88 855	10	41	
20	9.80 197	15	9.91 353	26	10.08 647	9.88 844	11	**40**	
21	9.80 213	16	9.91 379	26	10.08 621	9.88 834	10	39	
22	9.80 228	15	9.91 404	25	10.08 596	9.88 824	10	38	
23	9.80 244	16	9.91 430	26	10.08 570	9.88 813	11	37	
24	9.80 259	15	9.91 456	26	10.08 544	9.88 803	10	36	
25	9.80 274	15	9.91 482	26	10.08 518	9.88 793	10	35	
26	9.80 290	16	9.91 507	25	10.08 493	9.88 782	11	34	
27	9.80 305	15	9.91 533	26	10.08 467	9.88 772	10	33	
28	9.80 320	15	9.91 559	26	10.08 441	9.88 761	11	32	
29	9.80 336	16	9.91 585	26	10.08 415	9.88 751	10	31	
30	9.80 351	15	9.91 610	25	10.08 390	9.88 741	10	**30**	
31	9.80 366	15	9.91 636	26	10.08 364	9.88 730	11	29	
32	9.80 382	16	9.91 662	26	10.08 338	9.88 720	10	28	
33	9.80 397	15	9.91 688	26	10.08 312	9.88 709	11	27	
34	9.80 412	15	9.91 713	25	10.08 287	9.88 699	10	26	
35	9.80 428	16	9.91 739	26	10.08 261	9.88 688	11	25	
36	9.80 443	15	9.91 765	26	10.08 235	9.88 678	10	24	
37	9.80 458	15	9.91 791	26	10.08 209	9.88 668	10	23	
38	9.80 473	15	9.91 816	25	10.08 184	9.88 657	11	22	
39	9.80 489	16	9.91 842	26	10.08 158	9.88 647	10	21	
40	9.80 504	15	9.91 868	26	10.08 132	9.88 636	11	**20**	
41	9.80 519	15	9.91 893	25	10.08 107	9.88 626	10	19	
42	9.80 534	15	9.91 919	26	10.08 081	9.88 615	11	18	
43	9.80 550	16	9.91 945	26	10.08 055	9.88 605	10	17	
44	9.80 565	15	9.91 971	26	10.08 029	9.88 594	11	16	
45	9.80 580	15	9.91 996	25	10.08 004	9.88 584	10	15	
46	9.80 595	15	9.92 022	26	10.07 978	9.88 573	11	14	
47	9.80 610	15	9.92 048	26	10.07 952	9.88 563	10	13	
48	9.80 625	15	9.92 073	25	10.07 927	9.88 552	11	12	
49	9.80 641	16	9.92 099	26	10.07 901	9.88 542	10	11	
50	9.80 656	15	9.92 125	26	10.07 875	9.88 531	11	**10**	
51	9.80 671	15	9.92 150	25	10.07 850	9.88 521	10	9	
52	9.80 686	15	9.92 176	26	10.07 824	9.88 510	11	8	
53	9.80 701	15	9.92 202	26	10.07 798	9.88 499	11	7	
54	9.80 716	15	9.92 227	25	10.07 773	9.88 489	10	6	
55	9.80 731	15	9.92 253	26	10.07 747	9.88 478	11	5	
56	9.80 746	15	9.92 279	26	10.07 721	9.88 468	10	4	
57	9.80 762	16	9.92 304	25	10.07 696	9.88 457	11	3	
58	9.80 777	15	9.92 330	26	10.07 670	9.88 447	10	2	
59	9.80 792	15	9.92 356	26	10.07 644	9.88 436	11	1	
60	9.80 807	15	9.92 381	25	10.07 619	9.88 425	11	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	26	25
6	2.6	2.5
7	3.0	2.9
8	3.5	3.3
9	3.9	3.8
10	4.3	4.2
20	8.7	8.3
30	13.0	12.5
40	17.3	16.7
50	21.7	20.8

″	16	15
6	1.6	1.5
7	1.9	1.8
8	2.1	2.0
9	2.4	2.2
10	2.7	2.5
20	5.3	5.0
30	8.0	7.5
40	10.7	10.0
50	13.3	12.5

″	11	10
6	1.1	1.0
7	1.3	1.2
8	1.5	1.3
9	1.6	1.5
10	1.8	1.7
20	3.7	3.3
30	5.5	5.0
40	7.3	6.7
50	9.2	8.3

50°

40°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.80 807		9.92 381		10.07 619	9.88 425		**60**	
1	9.80 822	15	9.92 407	26	10.07 593	9.88 415	10	59	
2	9.80 837	15	9.92 433	26	10.07 567	9.88 404	11	58	
3	9.80 852	15	9.92 458	25	10.07 542	9.88 394	10	57	
4	9.80 867	15	9.92 484	26	10.07 516	9.88 383	11	56	
5	9.80 882	15	9.92 510	26	10.07 490	9.88 372	11	55	
6	9.80 897	15	9.92 535	25	10.07 465	9.88 362	10	54	
7	9.80 912	15	9.92 561	26	10.07 439	9.88 351	11	53	
8	9.80 927	15	9.92 587	26	10.07 413	9.88 340	11	52	
9	9.80 942	15	9.92 612	25	10.07 388	9.88 330	10	51	
10	9.80 957	15	9.92 638	26	10.07 362	9.88 319	11	**50**	
11	9.80 972	15	9.92 663	25	10.07 337	9.88 308	11	49	
12	9.80 987	15	9.92 689	26	10.07 311	9.88 298	10	48	
13	9.81 002	15	9.92 715	26	10.07 285	9.88 287	11	47	
14	9.81 017	15	9.92 740	25	10.07 260	9.88 276	11	46	
15	9.81 032	15	9.92 766	26	10.07 234	9.88 266	10	45	
16	9.81 047	15	9.92 792	26	10.07 208	9.88 255	11	44	
17	9.81 061	14	9.92 817	25	10.07 183	9.88 244	11	43	
18	9.81 076	15	9.92 843	26	10.07 157	9.88 234	10	42	
19	9.81 091	15	9.92 868	25	10.07 132	9.88 223	11	41	
20	9.81 106	15	9.92 894	26	10.07 106	9.88 212	11	**40**	
21	9.81 121	15	9.92 920	26	10.07 080	9.88 201	11	39	
22	9.81 136	15	9.92 945	25	10.07 055	9.88 191	10	38	
23	9.81 151	15	9.92 971	26	10.07 029	9.88 180	11	37	
24	9.81 166	15	9.92 996	25	10.07 004	9.88 169	11	36	
25	9.81 180	14	9.93 022	26	10.06 978	9.88 158	11	35	
26	9.81 195	15	9.93 048	26	10.06 952	9.88 148	10	34	
27	9.81 210	15	9.93 073	25	10.06 927	9.88 137	11	33	
28	9.81 225	15	9.93 099	26	10.06 901	9.88 126	11	32	
29	9.81 240	15	9.93 124	25	10.06 876	9.88 115	11	31	
30	9.81 254	14	9.93 150	26	10.06 850	9.88 105	10	**30**	
31	9.81 269	15	9.93 175	25	10.06 825	9.88 094	11	29	
32	9.81 284	15	9.93 201	26	10.06 799	9.88 083	11	28	
33	9.81 299	15	9.93 227	26	10.06 773	9.88 072	11	27	
34	9.81 314	15	9.93 252	25	10.06 748	9.88 061	11	26	
35	9.81 328	14	9.93 278	26	10.06 722	9.88 051	10	25	
36	9.81 343	15	9.93 303	25	10.06 697	9.88 040	11	24	
37	9.81 358	15	9.93 329	26	10.06 671	9.88 029	11	23	
38	9.81 372	14	9.93 354	25	10.06 646	9.88 018	11	22	
39	9.81 387	15	9.93 380	26	10.06 620	9.88 007	11	21	
40	9.81 402	15	9.93 406	26	10.06 594	9.87 996	11	**20**	
41	9.81 417	15	9.93 431	25	10.06 569	9.87 985	11	19	
42	9.81 431	14	9.93 457	26	10.06 543	9.87 975	10	18	
43	9.81 446	15	9.93 482	25	10.06 518	9.87 964	11	17	
44	9.81 461	15	9.93 508	26	10.06 492	9.87 953	11	16	
45	9.81 475	14	9.93 533	25	10.06 467	9.87 942	11	15	
46	9.81 490	15	9.93 559	26	10.06 441	9.87 931	11	14	
47	9.81 505	15	9.93 584	25	10.06 416	9.87 920	11	13	
48	9.81 519	14	9.93 610	26	10.06 390	9.87 909	11	12	
49	9.81 534	15	9.93 636	26	10.06 364	9.87 898	11	11	
50	9.81 549	15	9.93 661	25	10.06 339	9.87 887	11	**10**	
51	9.81 563	14	9.93 687	26	10.06 313	9.87 877	10	9	
52	9.81 578	15	9.93 712	25	10.06 288	9.87 866	11	8	
53	9.81 592	14	9.93 738	26	10.06 262	9.87 855	11	7	
54	9.81 607	15	9.93 763	25	10.06 237	9.87 844	11	6	
55	9.81 622	15	9.93 789	26	10.06 211	9.87 833	11	5	
56	9.81 636	14	9.93 814	25	10.06 186	9.87 822	11	4	
57	9.81 651	15	9.93 840	26	10.06 160	9.87 811	11	3	
58	9.81 665	14	9.93 865	25	10.06 135	9.87 800	11	2	
59	9.81 680	15	9.93 891	26	10.06 109	9.87 789	11	1	
60	9.81 694	14	9.93 916	25	10.06 084	9.87 778	11	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	26	25
6	2.6	2.5
7	3.0	2.9
8	3.5	3.3
9	3.9	3.8
10	4.3	4.2
20	8.7	8.3
30	13.0	12.5
40	17.3	16.7
50	21.7	20.8

″	15	14
6	1.5	1.4
7	1.8	1.6
8	2.0	1.9
9	2.2	2.1
10	2.5	2.3
20	5.0	4.7
30	7.5	7.0
40	10.0	9.3
50	12.5	11.7

″	11	10
6	1.1	1.0
7	1.3	1.2
8	1.5	1.3
9	1.6	1.5
10	1.8	1.7
20	3.7	3.3
30	5.5	5.0
40	7.3	6.7
50	9.2	8.3

49°

41°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.81 694		9.93 916		10.06 084	9.87 778		**60**	
1	9.81 709	15	9.93 942	26	10.06 058	9.87 767	11	59	
2	9.81 723	14	9.93 967	25	10.06 033	9.87 756	11	58	
3	9.81 738	15	9.93 993	26	10.06 007	9.87 745	11	57	
4	9.81 752	14	9.94 018	25	10.05 982	9.87 734	11	56	
5	9.81 767	15	9.94 044	26	10.05 956	9.87 723	11	55	
6	9.81 781	14	9.94 069	25	10.05 931	9.87 712	11	54	
7	9.81 796	15	9.94 095	26	10.05 905	9.87 701	11	53	
8	9.81 810	14	9.94 120	25	10.05 880	9.87 690	11	52	
9	9.81 825	15	9.94 146	26	10.05 854	9.87 679	11	51	
10	9.81 839	14	9.94 171	25	10.05 829	9.87 668	11	**50**	
11	9.81 854	15	9.94 197	26	10.05 803	9.87 657	11	49	
12	9.81 868	14	9.94 222	25	10.05 778	9.87 646	11	48	
13	9.81 882	14	9.94 248	26	10.05 752	9.87 635	11	47	
14	9.81 897	15	9.94 273	25	10.05 727	9.87 624	11	46	
15	9.81 911	14	9.94 299	26	10.05 701	9.87 613	11	45	
16	9.81 926	15	9.94 324	25	10.05 676	9.87 601	12	44	
17	9.81 940	14	9.94 350	26	10.05 650	9.87 590	11	43	
18	9.81 955	15	9.94 375	25	10.05 625	9.87 579	11	42	
19	9.81 969	14	9.94 401	26	10.05 599	9.87 568	11	41	
20	9.81 983	14	9.94 426	25	10.05 574	9.87 557	11	**40**	
21	9.81 998	15	9.94 452	26	10.05 548	9.87 546	11	39	
22	9.82 012	14	9.94 477	25	10.05 523	9.87 535	11	38	
23	9.82 026	14	9.94 503	26	10.05 497	9.87 524	11	37	
24	9.82 041	15	9.94 528	25	10.05 472	9.87 513	11	36	
25	9.82 055	14	9.94 554	26	10.05 446	9.87 501	12	35	
26	9.82 069	14	9.94 579	25	10.05 421	9.87 490	11	34	
27	9.82 084	15	9.94 604	25	10.05 396	9.87 479	11	33	
28	9.82 098	14	9.94 630	26	10.05 370	9.87 468	11	32	
29	9.82 112	14	9.94 655	25	10.05 345	9.87 457	11	31	
30	9.82 126	14	9.94 681	26	10.05 319	9.87 446	11	**30**	
31	9.82 141	15	9.94 706	25	10.05 294	9.87 434	12	29	
32	9.82 155	14	9.94 732	26	10.05 268	9.87 423	11	28	
33	9.82 169	14	9.94 757	25	10.05 243	9.87 412	11	27	
34	9.82 184	15	9.94 783	26	10.05 217	9.87 401	11	26	
35	9.82 198	14	9.94 808	25	10.05 192	9.87 390	11	25	
36	9.82 212	14	9.94 834	26	10.05 166	9.87 378	12	24	
37	9.82 226	14	9.94 859	25	10.05 141	9.87 367	11	23	
38	9.82 240	14	9.94 884	25	10.05 116	9.87 356	11	22	
39	9.82 255	15	9.94 910	26	10.05 090	9.87 345	11	21	
40	9.82 269	14	9.94 935	25	10.05 065	9.87 334	11	**20**	
41	9.82 283	14	9.94 961	26	10.05 039	9.87 322	12	19	
42	9.82 297	14	9.94 986	25	10.05 014	9.87 311	11	18	
43	9.82 311	14	9.95 012	26	10.04 988	9.87 300	11	17	
44	9.82 326	15	9.95 037	25	10.04 963	9.87 288	12	16	
45	9.82 340	14	9.95 062	25	10.04 938	9.87 277	11	15	
46	9.82 354	14	9.95 088	26	10.04 912	9.87 266	11	14	
47	9.82 368	14	9.95 113	25	10.04 887	9.87 255	11	13	
48	9.82 382	14	9.95 139	26	10.04 861	9.87 243	12	12	
49	9.82 396	14	9.95 164	25	10.04 836	9.87 232	11	11	
50	9.82 410	14	9.95 190	26	10.04 810	9.87 221	11	**10**	
51	9.82 424	14	9.95 215	25	10.04 785	9.87 209	12	9	
52	9.82 439	15	9.95 240	25	10.04 760	9.87 198	11	8	
53	9.82 453	14	9.95 266	26	10.04 734	9.87 187	11	7	
54	9.82 467	14	9.95 291	25	10.04 709	9.87 175	12	6	
55	9.82 481	14	9.95 317	26	10.04 683	9.87 164	11	5	
56	9.82 495	14	9.95 342	25	10.04 658	9.87 153	11	4	
57	9.82 509	14	9.95 368	26	10.04 632	9.87 141	12	3	
58	9.82 523	14	9.95 393	25	10.04 607	9.87 130	11	2	
59	9.82 537	14	9.95 418	25	10.04 582	9.87 119	11	1	
60	9.82 551		9.95 444	26	10.04 556	9.87 107	12	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	26	25
6	2.6	2.5
7	3.0	2.9
8	3.5	3.3
9	3.9	3.8
10	4.3	4.2
20	8.7	8.3
30	13.0	12.5
40	17.3	16.7
50	21.7	20.8

″	15	14
6	1.5	1.4
7	1.8	1.6
8	2.0	1.9
9	2.2	2.1
10	2.5	2.3
20	5.0	4.7
30	7.5	7.0
40	10.0	9.3
50	12.5	11.7

″	12	11
6	1.2	1.1
7	1.4	1.3
8	1.6	1.5
9	1.8	1.6
10	2.0	1.8
20	4.0	3.7
30	6.0	5.5
40	8.0	7.3
50	10.0	9.2

48°

42°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.82 551		9.95 444		10.04 556	9.87 107		**60**	
1	9.82 565	14	9.95 469	25	10.04 531	9.87 096	11	59	
2	9.82 579	14	9.95 495	26	10.04 505	9.87 085	11	58	
3	9.82 593	14	9.95 520	25	10.04 480	9.87 073	12	57	
4	9.82 607	14	9.95 545	25	10.04 455	9.87 062	11	56	
5	9.82 621	14	9.95 571	26	10.04 429	9.87 050	12	55	
6	9.82 635	14	9.95 596	25	10.04 404	9.87 039	11	54	
7	9.82 649	14	9.95 622	26	10.04 378	9.87 028	11	53	
8	9.82 663	14	9.95 647	25	10.04 353	9.87 016	12	52	
9	9.82 677	14	9.95 672	25	10.04 328	9.87 005	11	51	
10	9.82 691	14	9.95 698	26	10.04 302	9.86 993	12	**50**	
11	9.82 705	14	9.95 723	25	10.04 277	9.86 982	11	49	
12	9.82 719	14	9.95 748	25	10.04 252	9.86 970	12	48	
13	9.82 733	14	9.95 774	26	10.04 226	9.86 959	11	47	
14	9.82 747	14	9.95 799	25	10 04 201	9.86 947	12	46	
15	9.82 761	14	9.95 825	26	10.04 175	9.86 936	11	45	
16	9.82 775	14	9.95 850	25	10.04 150	9.86 924	12	44	
17	9.82 788	13	9.95 875	25	10.04 125	9.86 913	11	43	
18	9.82 802	14	9.95 901	26	10.04 099	9.86 902	11	42	
19	9.82 816	14	9.95 926	25	10.04 074	9.86 890	12	41	
20	9.82 830	14	9.95 952	26	10.04 048	9.86 879	11	**40**	
21	9.82 844	14	9.95 977	25	10.04 023	9.86 867	12	39	
22	9.82 858	14	9.96 002	25	10.03 998	9.86 855	12	38	
23	9.82 872	14	9.96 028	26	10.03 972	9.86 844	11	37	
24	9.82 885	13	9.96 053	25	10.03 947	9.86 832	12	36	
25	9.82 899	14	9.96 078	25	10.03 922	9.86 821	11	35	
26	9.82 913	14	9.96 104	26	10.03 896	9.86 809	12	34	
27	9.82 927	14	9.96 129	25	10.03 871	9.86 798	11	33	
28	9.82 941	14	9.96 155	26	10.03 845	9.86 786	12	32	
29	9.82 955	14	9.96 180	25	10.03 820	9.86 775	11	31	
30	9.82 968	13	9.96 205	25	10.03 795	9.86 763	12	**30**	
31	9.82 982	14	9.96 231	26	10.03 769	9.86 752	11	29	
32	9.82 996	14	9.96 256	25	10.03 744	9.86 740	12	28	
33	9.83 010	14	9.96 281	25	10.03 719	9.86 728	12	27	
34	9.83 023	13	9.96 307	26	10.03 693	9.86 717	11	26	
35	9.83 037	14	9.96 332	25	10.03 668	9.86 705	12	25	
36	9.83 051	14	9.96 357	25	10.03 643	9.86 694	11	24	
37	9.83 065	14	9.96 383	26	10.03 617	9.86 682	12	23	
38	9.83 078	13	9.96 408	25	10.03 592	9.86 670	12	22	
39	9.83 092	14	9.96 433	25	10.03 567	9.86 659	11	21	
40	9.83 106	14	9.96 459	26	10.03 541	9.86 647	12	**20**	
41	9.83 120	14	9.96 484	25	10.03 516	9.86 635	12	19	
42	9.83 133	13	9.96 510	26	10.03 490	9.86 624	11	18	
43	9.83 147	14	9.96 535	25	10.03 465	9.86 612	12	17	
44	9.83 161	14	9.96 560	25	10.03 440	9.86 600	12	16	
45	9.83 174	13	9.96 586	26	10.03 414	9.86 589	11	15	
46	9.83 188	14	9.96 611	25	10.03 389	9.86 577	12	14	
47	9.83 202	14	9.96 636	25	10.03 364	9.86 565	12	13	
48	9.83 215	13	9.96 662	26	10.03 338	9.86 554	11	12	
49	9.83 229	14	9.96 687	25	10.03 313	9.86 542	12	11	
50	9.83 242	13	9.96 712	25	10.03 288	9.86 530	12	**10**	
51	9.83 256	14	9.96 738	26	10.03 262	9.86 518	12	9	
52	9.83 270	14	9.96 763	25	10.03 237	9.86 507	11	8	
53	9.83 283	13	9.96 788	25	10.03 212	9.86 495	12	7	
54	9.83 297	14	9.96 814	26	10.03 186	9.86 483	12	6	
55	9.83 310	13	9.96 839	25	10.03 161	9.86 472	11	5	
56	9.83 324	14	9.96 864	25	10.03 136	9.86 460	12	4	
57	9.83 338	14	9.96 890	26	10.03 110	9.86 448	12	3	
58	9.83 351	13	9.96 915	25	10.03 085	9.86 436	12	2	
59	9.83 365	14	9.96 940	25	10.03 060	9.86 425	11	1	
60	9.83 378	13	9.96 966	26	10.03 034	9.86 413	12	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	26	25
6	2.6	2.5
7	3.0	2.9
8	3.5	3.3
9	3.9	3.8
10	4.3	4.2
20	8.7	8.3
30	13.0	12.5
40	17.3	16.7
50	21.7	20.8

″	14	13
6	1.4	1.3
7	1.6	1.5
8	1.9	1.7
9	2.1	2.0
10	2.3	2.2
20	4.7	4.3
30	7.0	6.5
40	9.3	8.7
50	11.7	10.8

″	12	11
6	1.2	1.1
7	1.4	1.3
8	1.6	1.5
9	1.8	1.6
10	2.0	1.8
20	4.0	3.7
30	6.0	5.5
40	8.0	7.3
50	10.0	9.2

47°

43°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.83 378		9.96 966		10.03 034	9.86 413		**60**	
1	9.83 392	14	9.96 991	25	10.03 009	9.86 401	12	59	
2	9.83 405	13	9.97 016	25	10.02 984	9.86 389	12	58	
3	9.83 419	14	9.97 042	26	10.02 958	9.86 377	12	57	
4	9.83 432	13	9.97 067	25	10.02 933	9.86 366	11	56	
5	9.83 446	14	9.97 092	25	10.02 908	9.86 354	12	55	
6	9.83 459	13	9.97 118	26	10.02 882	9.86 342	12	54	
7	9.83 473	14	9.97 143	25	10.02 857	9.86 330	12	53	″ | **26** | **25**
8	9.83 486	13	9.97 168	25	10.02 832	9.86 318	12	52	
9	9.83 500	14	9.97 193	25	10.02 807	9.86 306	12	51	6 | 2.6 | 2.5
10	9.83 513	13	9.97 219	26	10.02 781	9.86 295	11	**50**	7 | 3.0 | 2.9
11	9.83 527	14	9.97 244	25	10.02 756	9.86 283	12	49	8 | 3.5 | 3.3
12	9.83 540	13	9.97 269	25	10.02 731	9.86 271	12	48	9 | 3.9 | 3.8
13	9.83 554	14	9.97 295	26	10.02 705	9.86 259	12	47	10 | 4.3 | 4.2
14	9.83 567	13	9.97 320	25	10.02 680	9.86 247	12	46	20 | 8.7 | 8.3
15	9.83 581	14	9.97 345	25	10.02 655	9.86 235	12	45	30 | 13.0 | 12.5
16	9.83 594	13	9.97 371	26	10.02 629	9.86 223	12	44	40 | 17.3 | 16.7
17	9.83 608	14	9.97 396	25	10.02 604	9.86 211	12	43	50 | 21.7 | 20.8
18	9.83 621	13	9.97 421	25	10.02 579	9.86 200	11	42	
19	9.83 634	13	9.97 447	26	10.02 553	9.86 188	12	41	
20	9.83 648	14	9.97 472	25	10.02 528	9.86 176	12	**40**	
21	9.83 661	13	9.97 497	25	10.02 503	9.86 164	12	39	
22	9.83 674	13	9.97 523	26	10.02 477	9.86 152	12	38	
23	9.83 688	14	9.97 548	25	10.02 452	9.86 140	12	37	
24	9.83 701	13	9.97 573	25	10.02 427	9.86 128	12	36	
25	9.83 715	14	9.97 598	25	10.02 402	9.86 116	12	35	
26	9.83 728	13	9.97 624	26	10.02 376	9.86 104	12	34	″ | **14** | **13**
27	9.83 741	13	9.97 649	25	10.02 351	9.86 092	12	33	
28	9.83 755	14	9.97 674	25	10.02 326	9.86 080	12	32	6 | 1.4 | 1.3
29	9.83 768	13	9.97 700	26	10.02 300	9.86 068	12	31	7 | 1.6 | 1.5
30	9.83 781	13	9.97 725	25	10.02 275	9.86 056	12	**30**	8 | 1.9 | 1.7
31	9.83 795	14	9.97 750	25	10.02 250	9.86 044	12	29	9 | 2.1 | 2.0
32	9.83 808	13	9.97 776	26	10.02 224	9.86 032	12	28	10 | 2.3 | 2.2
33	9.83 821	13	9.97 801	25	10.02 199	9.86 020	12	27	20 | 4.7 | 4.3
34	9.83 834	13	9.97 826	25	10.02 174	9.86 008	12	26	30 | 7.0 | 6.5
35	9.83 848	14	9.97 851	25	10.02 149	9.85 996	12	25	40 | 9.3 | 8.7
36	9.83 861	13	9.97 877	26	10.02 123	9.85 984	12	24	50 | 11.7 | 10.8
37	9.83 874	13	9.97 902	25	10.02 098	9.85 972	12	23	
38	9.83 887	13	9.97 927	25	10.02 073	9.85 960	12	22	
39	9.83 901	14	9.97 953	26	10.02 047	9.85 948	12	21	
40	9.83 914	13	9.97 978	25	10.02 022	9.85 936	12	**20**	
41	9.83 927	13	9.98 003	25	10.01 997	9.85 924	12	19	
42	9.83 940	13	9.98 029	26	10.01 971	9.85 912	12	18	
43	9.83 954	14	9.98 054	25	10.01 946	9.85 900	12	17	
44	9.83 967	13	9.98 079	25	10.01 921	9.85 888	12	16	
45	9.83 980	13	9.98 104	25	10.01 896	9.85 876	12	15	″ | **12** | **11**
46	9.83 993	13	9.98 130	26	10.01 870	9.85 864	12	14	
47	9.84 006	13	9.98 155	25	10.01 845	9.85 851	13	13	6 | 1.2 | 1.1
48	9.84 020	14	9.98 180	25	10.01 820	9.85 839	12	12	7 | 1.4 | 1.3
49	9.84 033	13	9.98 206	26	10.01 794	9.85 827	12	11	8 | 1.6 | 1.5
50	9.84 046	13	9.98 231	25	10.01 769	9.85 815	12	**10**	9 | 1.8 | 1.6
51	9.84 059	13	9.98 256	25	10.01 744	9.85 803	12	9	10 | 2.0 | 1.8
52	9.84 072	13	9.98 281	25	10.01 719	9.85 791	12	8	20 | 4.0 | 3.7
53	9.84 085	13	9.98 307	26	10.01 693	9.85 779	12	7	30 | 6.0 | 5.5
54	9.84 098	13	9.98 332	25	10.01 668	9.85 766	13	6	40 | 8.0 | 7.3
55	9.84 112	14	9.98 357	25	10.01 643	9.85 754	12	5	50 | 10.0 | 9.2
56	9.84 125	13	9.98 383	26	10.01 617	9.85 742	12	4	
57	9.84 138	13	9.98 408	25	10.01 592	9.85 730	12	3	
58	9.84 151	13	9.98 433	25	10.01 567	9.85 718	12	2	
59	9.84 164	13	9.98 458	25	10.01 542	9.85 706	12	1	
60	9.84 177		9.98 484	26	10.01 516	9.85 693	13	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

46°

44°

′	L Sin	d	L Tan	c d	L Cot	L Cos	d		Prop. Pts.
0	9.84 177		9.98 484		10.01 516	9.85 693		**60**	
1	9.84 190	13	9.98 509	25	10.01 491	9.85 681	12	59	
2	9.84 203	13	9.98 534	25	10.01 466	9.85 669	12	58	
3	9.84 216	13	9.98 560	26	10.01 440	9.85 657	12	57	
4	9.84 229	13	9.98 585	25	10.01 415	9.85 645	12	56	
5	9.84 242	13	9.98 610	25	10.01 390	9.85 632	13	55	
6	9.84 255	13	9.98 635	25	10.01 365	9.85 620	12	54	
7	9.84 269	14	9.98 661	26	10.01 339	9.85 608	12	53	
8	9.84 282	13	9.98 686	25	10.01 314	9.85 596	12	52	
9	9.84 295	13	9.98 711	25	10.01 289	9.85 583	13	51	
10	9.84 308	13	9.98 737	26	10.01 263	9.85 571	12	**50**	
11	9.84 321	13	9.98 762	25	10.01 238	9.85 559	12	49	
12	9.84 334	13	9.98 787	25	10.01 213	9.85 547	12	48	
13	9.84 347	13	9.98 812	25	10.01 188	9.85 534	13	47	
14	9.84 360	13	9.98 838	26	10.01 162	9.85 522	12	46	
15	9.84 373	13	9.98 863	25	10.01 137	9.85 510	12	45	
16	9.84 385	12	9.98 888	25	10.01 112	9.85 497	13	44	
17	9.84 398	13	9.98 913	25	10.01 087	9.85 485	12	43	
18	9.84 411	13	9.98 939	26	10.01 061	9.85 473	12	42	
19	9.84 424	13	9.98 964	25	10.01 036	9.85 460	13	41	
20	9.84 437	13	9.98 989	25	10.01 011	9.85 448	12	**40**	
21	9.84 450	13	9.99 015	26	10.00 985	9.85 436	12	39	
22	9.84 463	13	9.99 040	25	10.00 960	9.85 423	13	38	
23	9.84 476	13	9.99 065	25	10.00 935	9.85 411	12	37	
24	9.84 489	13	9.99 090	25	10.00 910	9.85 399	12	36	
25	9.84 502	13	9.99 116	26	10.00 884	9.85 386	13	35	
26	9.84 515	13	9.99 141	25	10.00 859	9.85 374	12	34	
27	9.84 528	13	9.99 166	25	10.00 834	9.85 361	13	33	
28	9.84 540	12	9.99 191	25	10.00 809	9.85 349	12	32	
29	9.84 553	13	9.99 217	26	10.00 783	9.85 337	12	31	
30	9.84 566	13	9.99 242	25	10.00 758	9.85 324	13	**30**	
31	9.84 579	13	9.99 267	25	10.00 733	9.85 312	12	29	
32	9.84 592	13	9.99 293	26	10.00 707	9.85 299	13	28	
33	9.84 605	13	9.99 318	25	10.00 682	9.85 287	12	27	
34	9.84 618	13	9.99 343	25	10.00 657	9.85 274	13	26	
35	9.84 630	12	9.99 368	25	10.00 632	9.85 262	12	25	
36	9.84 643	13	9.99 394	26	10.00 606	9.85 250	12	24	
37	9.84 656	13	9.99 419	25	10.00 581	9.85 237	13	23	
38	9.84 669	13	9.99 444	25	10.00 556	9.85 225	12	22	
39	9.84 682	13	9.99 469	25	10.00 531	9.85 212	13	21	
40	9.84 694	12	9.99 495	26	10.00 505	9.85 200	12	**20**	
41	9.84 707	13	9.99 520	25	10.00 480	9.85 187	13	19	
42	9.84 720	13	9.99 545	25	10.00 455	9.85 175	12	18	
43	9.84 733	13	9.99 570	25	10.00 430	9.85 162	13	17	
44	9.84 745	12	9.99 596	26	10.00 404	9.85 150	12	16	
45	9.84 758	13	9.99 621	25	10.00 379	9.85 137	13	15	
46	9.84 771	13	9.99 646	25	10.00 354	9.85 125	12	14	
47	9.84 784	13	9.99 672	26	10.00 328	9.85 112	13	13	
48	9.84 796	12	9.99 697	25	10.00 303	9.85 100	12	12	
49	9.84 809	13	9.99 722	25	10.00 278	9.85 087	13	11	
50	9.84 822	13	9.99 747	25	10.00 253	9.85 074	13	**10**	
51	9.84 835	13	9.99 773	26	10.00 227	9.85 062	12	9	
52	9.84 847	12	9.99 798	25	10.00 202	9.85 049	13	8	
53	9.84 860	13	9.99 823	25	10.00 177	9.85 037	12	7	
54	9.84 873	13	9.99 848	25	10.00 152	9.85 024	13	6	
55	9.84 885	12	9.99 874	26	10.00 126	9.85 012	12	5	
56	9.84 898	13	9.99 899	25	10.00 101	9.84 999	13	4	
57	9.84 911	13	9.99 924	25	10.00 076	9.84 986	13	3	
58	9.84 923	12	9.99 949	25	10.00 051	9.84 974	12	2	
59	9.84 936	13	9.99 975	26	10.00 025	9.84 961	13	1	
60	9.84 949	13	0.00 000	25	10.00 000	9.84 949	12	**0**	
	L Cos	d	L Cot	c d	L Tan	L Sin	d	′	Prop. Pts.

″	26	25	14
6	2.6	2.5	1.4
7	3.0	2.9	1.6
8	3.5	3.3	1.9
9	3.9	3.8	2.1
10	4.3	4.2	2.3
20	8.7	8.3	4.7
30	13.0	12.5	7.0
40	17.3	16.7	9.3
50	21.7	20.8	11.7

″	13	12
6	1.3	1.2
7	1.5	1.4
8	1.7	1.6
9	2.0	1.8
10	2.2	2.0
20	4.3	4.0
30	6.5	6.0
40	8.7	8.0
50	10.8	10.0

45°

TABLE VII

COMMON LOGARITHMS OF NUMBERS FROM 1 TO 10000 TO FIVE DECIMAL PLACES

1–100

N	Log	N	Log	N	Log	N	Log	N	Log
0	—	**20**	1. 30 103	**40**	1. 60 206	**60**	1. 77 815	**80**	1. 90 309
1	0. 00 000	21	1. 32 222	41	1. 61 278	61	1. 78 533	81	1. 90 849
2	0. 30 103	22	1. 34 242	42	1. 62 325	62	1. 79 239	82	1. 91 381
3	0. 47 712	23	1. 36 173	43	1. 63 347	63	1. 79 934	83	1. 91 908
4	0. 60 206	24	1. 38 021	44	1. 64 345	64	1. 80 618	84	1. 92 428
5	0. 69 897	25	1. 39 794	45	1. 65 321	65	1. 81 291	85	1. 92 942
6	0. 77 815	26	1. 41 497	46	1. 66 276	66	1. 81 954	86	1. 93 450
7	0. 84 510	27	1. 43 136	47	1. 67 210	67	1. 82 607	87	1. 93 952
8	0. 90 309	28	1. 44 716	48	1. 68 124	68	1. 83 251	88	1. 94 448
9	0. 95 424	29	1. 46 240	49	1. 69 020	69	1. 83 885	89	1. 94 939
10	1. 00 000	**30**	1. 47 712	**50**	1. 69 897	**70**	1. 84 510	**90**	1. 95 424
11	1. 04 139	31	1. 49 136	51	1. 70 757	71	1. 85 126	91	1. 95 904
12	1. 07 918	32	1. 50 515	52	1. 71 600	72	1. 85 733	92	1. 96 379
13	1. 11 394	33	1. 51 851	53	1. 72 428	73	1. 86 332	93	1. 96 848
14	1. 14 613	34	1. 53 148	54	1. 73 239	74	1. 86 923	94	1. 97 313
15	1. 17 609	35	1. 54 407	55	1. 74 036	75	1. 87 506	95	1. 97 772
16	1. 20 412	36	1. 55 630	56	1. 74 819	76	1. 88 081	96	1. 98 227
17	1. 23 045	37	1. 56 820	57	1. 75 587	77	1. 88 649	97	1. 98 677
18	1. 25 527	38	1. 57 978	58	1. 76 343	78	1. 89 209	98	1. 99 123
19	1. 27 875	39	1. 59 106	59	1. 77 085	79	1. 89 763	99	1. 99 564
20	1. 30 103	**40**	1. 60 206	**60**	1. 77 815	**80**	1. 90 309	**100**	2. 00 000

100–150

N	L 0	1	2	3	4	5	6	7	8	9
100	00 000	043	087	130	173	217	260	303	346	389
101	432	475	518	561	604	647	689	732	775	817
102	860	903	945	988	*030	*072	*115	*157	*199	*242
103	01 284	326	368	410	452	494	536	578	620	662
104	703	745	787	828	870	912	953	995	*036	*078
105	02 119	160	202	243	284	325	366	407	449	490
106	531	572	612	653	694	735	776	816	857	898
107	938	979	*019	*060	*100	*141	*181	*222	*262	*302
108	03 342	383	423	463	503	543	583	623	663	703
109	743	782	822	862	902	941	981	*021	*060	*100
110	04 139	179	218	258	297	336	376	415	454	493
111	532	571	610	650	689	727	766	805	844	883
112	922	961	999	*038	*077	*115	*154	*192	*231	*269
113	05 308	346	385	423	461	500	538	576	614	652
114	690	729	767	805	843	881	918	956	994	*032
115	06 070	108	145	183	221	258	296	333	371	408
116	446	483	521	558	595	633	670	707	744	781
117	819	856	893	930	967	*004	*041	*078	*115	*151
118	07 188	225	262	298	335	372	408	445	482	518
119	555	591	628	664	700	737	773	809	846	882
120	918	954	990	*027	*063	*099	*135	*171	*207	*243
121	08 279	314	350	386	422	458	493	529	565	600
122	636	672	707	743	778	814	849	884	920	955
123	991	*026	*061	*096	*132	*167	*202	*237	*272	*307
124	09 342	377	412	447	482	517	552	587	621	656
125	691	726	760	795	830	864	899	934	968	*003
126	10 037	072	106	140	175	209	243	278	312	346
127	380	415	449	483	517	551	585	619	653	687
128	721	755	789	823	857	890	924	958	992	*025
129	11 059	093	126	160	193	227	261	294	327	361
130	394	428	461	494	528	561	594	628	661	694
131	727	760	793	826	860	893	926	959	992	*024
132	12 057	090	123	156	189	222	254	287	320	352
133	385	418	450	483	516	548	581	613	646	678
134	710	743	775	808	840	872	905	937	969	*001
135	13 033	066	098	130	162	194	226	258	290	322
136	354	386	418	450	481	513	545	577	609	640
137	672	704	735	767	799	830	862	893	925	956
138	988	*019	*051	*082	*114	*145	*176	*208	*239	*270
139	14 301	333	364	395	426	457	489	520	551	582
140	613	644	675	706	737	768	799	829	860	891
141	922	953	983	*014	*045	*076	*106	*137	*168	*198
142	15 229	259	290	320	351	381	412	442	473	503
143	534	564	594	625	655	685	715	746	776	806
144	836	866	897	927	957	987	*017	*047	*077	*107
145	16 137	167	197	227	256	286	316	346	376	406
146	435	465	495	524	554	584	613	643	673	702
147	732	761	791	820	850	879	909	938	967	997
148	17 026	056	085	114	143	173	202	231	260	289
149	319	348	377	406	435	464	493	522	551	580
150	609	638	667	696	725	754	782	811	840	869

Prop. Pts.			
	44	**43**	**42**
1	4.4	4.3	4.2
2	8.8	8.6	8.4
3	13.2	12.9	12.6
4	17.6	17.2	16.8
5	22.0	21.5	21.0
6	26.4	25.8	25.2
7	30.8	30.1	29.4
8	35.2	34.4	33.6
9	39.6	38.7	37.8
	41	**40**	**39**
1	4.1	4.0	3.9
2	8.2	8.0	7.8
3	12.3	12.0	11.7
4	16.4	16.0	15.6
5	20.5	20.0	19.5
6	24.6	24.0	23.4
7	28.7	28.0	27.3
8	32.8	32.0	31.2
9	36.9	36.0	35.1
	38	**37**	**36**
1	3.8	3.7	3.6
2	7.6	7.4	7.2
3	11.4	11.1	10.8
4	15.2	14.8	14.4
5	19.0	18.5	18.0
6	22.8	22.2	21.6
7	26.6	25.9	25.2
8	30.4	29.6	28.8
9	34.2	33.3	32.4
	35	**34**	**33**
1	3.5	3.4	3.3
2	7.0	6.8	6.6
3	10.5	10.2	9.9
4	14.0	13.6	13.2
5	17.5	17.0	16.5
6	21.0	20.4	19.8
7	24.5	23.8	23.1
8	28.0	27.2	26.4
9	31.5	30.6	29.7
	32	**31**	**30**
1	3.2	3.1	3.0
2	6.4	6.2	6.0
3	9.6	9.3	9.0
4	12.8	12.4	12.0
5	16.0	15.5	15.0
6	19.2	18.6	18.0
7	22.4	21.7	21.0
8	25.6	24.8	24.0
9	28.8	27.9	27.0

N L 0 1 2 3 4 5 6 7 8 9 Prop. Pts.

150–200

N	L 0	1	2	3	4	5	6	7	8	9
150	17 609	638	667	696	725	754	782	811	840	869
151	898	926	955	984	*013	*041	*070	*099	*127	*156
152	18 184	213	241	270	298	327	355	384	412	441
153	469	498	526	554	583	611	639	667	696	724
154	752	780	808	837	865	893	921	949	977	*005
155	19 033	061	089	117	145	173	201	229	257	285
156	312	340	368	396	424	451	479	507	535	562
157	590	618	645	673	700	728	756	783	811	838
158	866	893	921	948	976	*003	*030	*058	*085	*112
159	20 140	167	194	222	249	276	303	330	358	385
160	412	439	466	493	520	548	575	602	629	656
161	683	710	737	763	790	817	844	871	898	925
162	952	978	*005	*032	*059	*085	*112	*139	*165	*192
163	21 219	245	272	299	325	352	378	405	431	458
164	484	511	537	564	590	617	643	669	696	722
165	748	775	801	827	854	880	906	932	958	985
166	22 011	037	063	089	115	141	167	194	220	246
167	272	298	324	350	376	401	427	453	479	505
168	531	557	583	608	634	660	686	712	737	763
169	789	814	840	866	891	917	943	968	994	*019
170	23 045	070	096	121	147	172	198	223	249	274
171	300	325	350	376	401	426	452	477	502	528
172	553	578	603	629	654	679	704	729	754	779
173	805	830	855	880	905	930	955	980	*005	*030
174	24 055	080	105	130	155	180	204	229	254	279
175	304	329	353	378	403	428	452	477	502	527
176	551	576	601	625	650	674	699	724	748	773
177	797	822	846	871	895	920	944	969	993	*018
178	25 042	066	091	115	139	164	188	212	237	261
179	285	310	334	358	382	406	431	455	479	503
180	527	551	575	600	624	648	672	696	720	744
181	768	792	816	840	864	888	912	935	959	983
182	26 007	031	055	079	102	126	150	174	198	221
183	245	269	293	316	340	364	387	411	435	458
184	482	505	529	553	576	600	623	647	670	694
185	717	741	764	788	811	834	858	881	905	928
186	951	975	998	*021	*045	*068	*091	*114	*138	*161
187	27 184	207	231	254	277	300	323	346	370	393
188	416	439	462	485	508	531	554	577	600	623
189	646	669	692	715	738	761	784	807	830	852
190	875	898	921	944	967	989	*012	*035	*058	*081
191	28 103	126	149	171	194	217	240	262	285	307
192	330	353	375	398	421	443	466	488	511	533
193	556	578	601	623	646	668	691	713	735	758
194	780	803	825	847	870	892	914	937	959	981
195	29 003	026	048	070	092	115	137	159	181	203
196	226	248	270	292	314	336	358	380	403	425
197	447	469	491	513	535	557	579	601	623	645
198	667	688	710	732	754	776	798	820	842	863
199	885	907	929	951	973	994	*016	*038	*060	*081
200	30 103	125	146	168	190	211	233	255	276	298

Prop. Pts.									
	29	**28**							
1	2.9	2.8							
2	5.8	5.6							
3	8.7	8.4							
4	11.6	11.2							
5	14.5	14.0							
6	17.4	16.8							
7	20.3	19.6							
8	23.2	22.4							
9	26.1	25.2							
	27	**26**							
1	2.7	2.6							
2	5.4	5.2							
3	8.1	7.8							
4	10.8	10.4							
5	13.5	13.0							
6	16.2	15.6							
7	18.9	18.2							
8	21.6	20.8							
9	24.3	23.4							
	25								
1	2.5								
2	5.0								
3	7.5								
4	10.0								
5	12.5								
6	15.0								
7	17.5								
8	20.0								
9	22.5								
	24	**23**							
1	2.4	2.3							
2	4.8	4.6							
3	7.2	6.9							
4	9.6	9.2							
5	12.0	11.5							
6	14.4	13.8							
7	16.8	16.1							
8	19.2	18.4							
9	21.6	20.7							
	22	**21**							
1	2.2	2.1							
2	4.4	4.2							
3	6.6	6.3							
4	8.8	8.4							
5	11.0	10.5							
6	13.2	12.6							
7	15.4	14.7							
8	17.6	16.8							
9	19.8	18.9							

N L 0 1 2 3 4 5 6 7 8 9 Prop. Pts.

200–250

N	L 0	1	2	3	4	5	6	7	8	9
200	30 103	125	146	168	190	211	233	255	276	298
201	320	341	363	384	406	428	449	471	492	514
202	535	557	578	600	621	643	664	685	707	728
203	750	771	792	814	835	856	878	899	920	942
204	963	984	*006	*027	*048	*069	*091	*112	*133	*154
205	31 175	197	218	239	260	281	302	323	345	366
206	387	408	429	450	471	492	513	534	555	576
207	597	618	639	660	681	702	723	744	765	785
208	806	827	848	869	890	911	931	952	973	994
209	32 015	035	056	077	098	118	139	160	181	201
210	222	243	263	284	305	325	346	366	387	408
211	428	449	469	490	510	531	552	572	593	613
212	634	654	675	695	715	736	756	777	797	818
213	838	858	879	899	919	940	960	980	*001	*021
214	33 041	062	082	102	122	143	163	183	203	224
215	244	264	284	304	325	345	365	385	405	425
216	445	465	486	506	526	546	566	586	606	626
217	646	666	686	706	726	746	766	786	806	826
218	846	866	885	905	925	945	965	985	*005	*025
219	34 044	064	084	104	124	143	163	183	203	223
220	242	262	282	301	321	341	361	380	400	420
221	439	459	479	498	518	537	557	577	596	616
222	635	655	674	694	713	733	753	772	792	811
223	830	850	869	889	908	928	947	967	986	*005
224	35 025	044	064	083	102	122	141	160	180	199
225	218	238	257	276	295	315	334	353	372	392
226	411	430	449	468	488	507	526	545	564	583
227	603	622	641	660	679	698	717	736	755	774
228	793	813	832	851	870	889	908	927	946	965
229	984	*003	*021	*040	*059	*078	*097	*116	*135	*154
230	36 173	192	211	229	248	267	286	305	324	342
231	361	380	399	418	436	455	474	493	511	530
232	549	568	586	605	624	642	661	680	698	717
233	736	754	773	791	810	829	847	866	884	903
234	922	940	959	977	996	*014	*033	*051	*070	*088
235	37 107	125	144	162	181	199	218	236	254	273
236	291	310	328	346	365	383	401	420	438	457
237	475	493	511	530	548	566	585	603	621	639
238	658	676	694	712	731	749	767	785	803	822
239	840	858	876	894	912	931	949	967	985	*003
240	38 021	039	057	075	093	112	130	148	166	184
241	202	220	238	256	274	292	310	328	346	364
242	382	399	417	435	453	471	489	507	525	543
243	561	578	596	614	632	650	668	686	703	721
244	739	757	775	792	810	828	846	863	881	899
245	917	934	952	970	987	*005	*023	*041	*058	*076
246	39 094	111	129	146	164	182	199	217	235	252
247	270	287	305	322	340	358	375	393	410	428
248	445	463	480	498	515	533	550	568	585	602
249	620	637	655	672	690	707	724	742	759	777
250	794	811	829	846	863	881	898	915	933	950

Prop. Pts.										
	22	**21**								
1	2.2	2.1								
2	4.4	4.2								
3	6.6	6.3								
4	8.8	8.4								
5	11.0	10.5								
6	13.2	12.6								
7	15.4	14.7								
8	17.6	16.8								
9	19.8	18.9								
	20									
1	2.0									
2	4.0									
3	6.0									
4	8.0									
5	10.0									
6	12.0									
7	14.0									
8	16.0									
9	18.0									
	19									
1	1.9									
2	3.8									
3	5.7									
4	7.6									
5	9.5									
6	11.4									
7	13.3									
8	15.2									
9	17.1									
	18									
1	1.8									
2	3.6									
3	5.4									
4	7.2									
5	9.0									
6	10.8									
7	12.6									
8	14.4									
9	16.2									
	17									
1	1.7									
2	3.4									
3	5.1									
4	6.8									
5	8.5									
6	10.2									
7	11.9									
8	13.6									
9	15.3									

N L 0 1 2 3 4 5 6 7 8 9 Prop. Pts.

250–300

N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.
250	39 794	811	829	846	863	881	898	915	933	950	
251	967	985	*002	*019	*037	*054	*071	*088	*106	*123	
252	40 140	157	175	192	209	226	243	261	278	295	**18**
253	312	329	346	364	381	398	415	432	449	466	
254	483	500	518	535	552	569	586	603	620	637	1 1.8
255	654	671	688	705	722	739	756	773	790	807	2 3.6
256	824	841	858	875	892	909	926	943	960	976	3 5.4
257	993	*010	*027	*044	*061	*078	*095	*111	*128	*145	4 7.2
258	41 162	179	196	212	229	246	263	280	296	313	5 9.0
259	330	347	363	380	397	414	430	447	464	481	6 10.8
260	497	514	531	547	564	581	597	614	631	647	7 12.6
261	664	681	697	714	731	747	764	780	797	814	8 14.4
262	830	847	863	880	896	913	929	946	963	979	9 16.2
263	996	*012	*029	*045	*062	*078	*095	*111	*127	*144	
264	42 160	177	193	210	226	243	259	275	292	308	**17**
265	325	341	357	374	390	406	423	439	455	472	1 1.7
266	488	504	521	537	553	570	586	602	619	635	2 3.4
267	651	667	684	700	716	732	749	765	781	797	3 5.1
268	813	830	846	862	878	894	911	927	943	959	4 6.8
269	975	991	*008	*024	*040	*056	*072	*088	*104	*120	5 8.5
270	43 136	152	169	185	201	217	233	249	265	281	6 10.2
271	297	313	329	345	361	377	393	409	425	441	7 11.9
272	457	473	489	505	521	537	553	569	584	600	8 13.6
273	616	632	648	664	680	696	712	727	743	759	9 15.3
274	775	791	807	823	838	854	870	886	902	917	
275	933	949	965	981	996	*012	*028	*044	*059	*075	**16**
276	44 091	107	122	138	154	170	185	201	217	232	1 1.6
277	248	264	279	295	311	326	342	358	373	389	2 3.2
278	404	420	436	451	467	483	498	514	529	545	3 4.8
279	560	576	592	607	623	638	654	669	685	700	4 6.4
280	716	731	747	762	778	793	809	824	840	855	5 8.0
281	871	886	902	917	932	948	963	979	994	*010	6 9.6
282	45 025	040	056	071	086	102	117	133	148	163	7 11.2
283	179	194	209	225	240	255	271	286	301	317	8 12.8
284	332	347	362	378	393	408	423	439	454	469	9 14.4
285	484	500	515	530	545	561	576	591	606	621	
286	637	652	667	682	697	712	728	743	758	773	**15**
287	788	803	818	834	849	864	879	894	909	924	1 1.5
288	939	954	969	984	*000	*015	*030	*045	*060	*075	2 3.0
289	46 090	105	120	135	150	165	180	195	210	225	3 4.5
290	240	255	270	285	300	315	330	345	359	374	4 6.0
291	389	404	419	434	449	464	479	494	509	523	5 7.5
292	538	553	568	583	598	613	627	642	657	672	6 9.0
293	687	702	716	731	746	761	776	790	805	820	7 10.5
294	835	850	864	879	894	909	923	938	953	967	8 12.0
295	982	997	*012	*026	*041	*056	*070	*085	*100	*114	9 13.5
296	47 129	144	159	173	188	202	217	232	246	261	
297	276	290	305	319	334	349	363	378	392	407	**14**
298	422	436	451	465	480	494	509	524	538	553	1 1.4
299	567	582	596	611	625	640	654	669	683	698	2 2.8
300	712	727	741	756	770	784	799	813	828	842	3 4.2
N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.

4 5.6
5 7.0
6 8.4
7 9.8
8 11.2
9 12.6

$\log e = .43429$

300–350

N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.
300	47 712	727	741	756	770	784	799	813	828	842	
301	857	871	885	900	914	929	943	958	972	986	
302	48 001	015	029	044	058	073	087	101	116	130	
303	144	159	173	187	202	216	230	244	259	273	
304	287	302	316	330	344	359	373	387	401	416	**15**
305	430	444	458	473	487	501	515	530	544	558	1 1.5
306	572	586	601	615	629	643	657	671	686	700	2 3.0
307	714	728	742	756	770	785	799	813	827	841	3 4.5
308	855	869	883	897	911	926	940	954	968	982	4 6.0
309	996	*010	*024	*038	*052	*066	*080	*094	*108	*122	5 7.5
310	49 136	150	164	178	192	206	220	234	248	262	6 9.0 7 10.5 8 12.0 9 13.5
311	276	290	304	318	332	346	360	374	388	402	
312	415	429	443	457	471	485	499	513	527	541	
313	554	568	582	596	610	624	638	651	665	679	
314	693	707	721	734	748	762	776	790	803	817	
315	831	845	859	872	886	900	914	927	941	955	
316	969	982	996	*010	*024	*037	*051	*065	*079	*092	**14**
317	50 106	120	133	147	161	174	188	202	215	229	1 1.4
318	243	256	270	284	297	311	325	338	352	365	2 2.8
319	379	393	406	420	433	447	461	474	488	501	3 4.2 4 5.6
320	515	529	542	556	569	583	596	610	623	637	5 7.0 6 8.4
321	651	664	678	691	705	718	732	745	759	772	7 9.8
322	786	799	813	826	840	853	866	880	893	907	8 11.2
323	920	934	947	961	974	987	*001	*014	*028	*041	9 12.6
324	51 055	068	081	095	108	121	135	148	162	175	
325	188	202	215	228	242	255	268	282	295	308	
326	322	335	348	362	375	388	402	415	428	441	
327	455	468	481	495	508	521	534	548	561	574	
328	587	601	614	627	640	654	667	680	693	706	**13**
329	720	733	746	759	772	786	799	812	825	838	1 1.3
330	851	865	878	891	904	917	930	943	957	970	2 2.6
331	983	996	*009	*022	*035	*048	*061	*075	*088	*101	3 3.9
332	52 114	127	140	153	166	179	192	205	218	231	4 5.2
333	244	257	270	284	297	310	323	336	349	362	5 6.5
334	375	388	401	414	427	440	453	466	479	492	6 7.8 7 9.1
335	504	517	530	543	556	569	582	595	608	621	8 10.4 9 11.7
336	634	647	660	673	686	699	711	724	737	750	
337	763	776	789	802	815	827	840	853	866	879	
338	892	905	917	930	943	956	969	982	994	*007	
339	53 020	033	046	058	071	084	097	110	122	135	**12**
340	148	161	173	186	199	212	224	237	250	263	1 1.2
341	275	288	301	314	326	339	352	364	377	390	2 2.4
342	403	415	428	441	453	466	479	491	504	517	3 3.6
343	529	542	555	567	580	593	605	618	631	643	4 4.8
344	656	668	681	694	706	719	732	744	757	769	5 6.0 6 7.2 7 8.4
345	782	794	807	820	832	845	857	870	882	895	8 9.6
346	908	920	933	945	958	970	983	995	*008	*020	9 10.8
347	54 033	045	058	070	083	095	108	120	133	145	
348	158	170	183	195	208	220	233	245	258	270	
349	283	295	307	320	332	345	357	370	382	394	
350	407	419	432	444	456	469	481	494	506	518	
N	**L 0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Prop. Pts.**

$\log \pi = .49715$

350–400

N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.
350	54 407	419	432	444	456	469	481	494	506	518	
351	531	543	555	568	580	593	605	617	630	642	
352	654	667	679	691	704	716	728	741	753	765	
353	777	790	802	814	827	839	851	864	876	888	
354	900	913	925	937	949	962	974	986	998	*011	**13**
355	55 023	035	047	060	072	084	096	108	121	133	1 1.3
356	145	157	169	182	194	206	218	230	242	255	2 2.6
357	267	279	291	303	315	328	340	352	364	376	3 3.9
358	388	400	413	425	437	449	461	473	485	497	4 5.2
359	509	522	534	546	558	570	582	594	606	618	5 6.5
360	630	642	654	666	678	691	703	715	727	739	6 7.8 7 9.1 8 10.4 9 11.7
361	751	763	775	787	799	811	823	835	847	859	
362	871	883	895	907	919	931	943	955	967	979	
363	991	*003	*015	*027	*038	*050	*062	*074	*086	*098	
364	56 110	122	134	146	158	170	182	194	205	217	
365	229	241	253	265	277	289	301	312	324	336	**12**
366	348	360	372	384	396	407	419	431	443	455	
367	467	478	490	502	514	526	538	549	561	573	1 1.2
368	585	597	608	620	632	644	656	667	679	691	2 2.4
369	703	714	726	738	750	761	773	785	797	808	3 3.6 4 4.8 5 6.0
370	820	832	844	855	867	879	891	902	914	926	6 7.2 7 8.4
371	937	949	961	972	984	996	*008	*019	*031	*043	8 9.6
372	57 054	066	078	089	101	113	124	136	148	159	9 10.8
373	171	183	194	206	217	229	241	252	264	276	
374	287	299	310	322	334	345	357	368	380	392	
375	403	415	426	438	449	461	473	484	496	507	
376	519	530	542	553	565	576	588	600	611	623	
377	634	646	657	669	680	692	703	715	726	738	**11**
378	749	761	772	784	795	807	818	830	841	852	
379	864	875	887	898	910	921	933	944	955	967	1 1.1
380	978	990	*001	*013	*024	*035	*047	*058	*070	*081	2 2.2 3 3.3 4 4.4
381	58 092	104	115	127	138	149	161	172	184	195	5 5.5
382	206	218	229	240	252	263	274	286	297	309	6 6.6
383	320	331	343	354	365	377	388	399	410	422	7 7.7
384	433	444	456	467	478	490	501	512	524	535	8 8.8 9 9.9
385	546	557	569	580	591	602	614	625	636	647	
386	659	670	681	692	704	715	726	737	749	760	
387	771	782	794	805	816	827	838	850	861	872	
388	883	894	906	917	928	939	950	961	973	984	
389	995	*006	*017	*028	*040	*051	*062	*073	*084	*095	**10**
390	59 106	118	129	140	151	162	173	184	195	207	1 1.0
391	218	229	240	251	262	273	284	295	306	318	2 2.0
392	329	340	351	362	373	384	395	406	417	428	3 3.0
393	439	450	461	472	483	494	506	517	528	539	4 4.0
394	550	561	572	583	594	605	616	627	638	649	5 5.0 6 6.0 7 7.0
395	660	671	682	693	704	715	726	737	748	759	8 8.0
396	770	780	791	802	813	824	835	846	857	868	9 9.0
397	879	890	901	912	923	934	945	956	966	977	
398	988	999	*010	*021	*032	*043	*054	*065	*076	*086	
399	60 097	108	119	130	141	152	163	173	184	195	
400	206	217	228	239	249	260	271	282	293	304	
N	**L 0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Prop. Pts.**

400–450

N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.
400	60 206	217	228	239	249	260	271	282	293	304	
401	314	325	336	347	358	369	379	390	401	412	
402	423	433	444	455	466	477	487	498	509	520	
403	531	541	552	563	574	584	595	606	617	627	
404	638	649	660	670	681	692	703	713	724	735	
405	746	756	767	778	788	799	810	821	831	842	
406	853	863	874	885	895	906	917	927	938	949	**11**
407	959	970	981	991	*002	*013	*023	*034	*045	*055	
408	61 066	077	087	098	109	119	130	140	151	162	1 1.1
409	172	183	194	204	215	225	236	247	257	268	2 2.2
											3 3.3
410	278	289	300	310	321	331	342	352	363	374	4 4.4
											5 5.5
411	384	395	405	416	426	437	448	458	469	479	6 6.6
412	490	500	511	521	532	542	553	563	574	584	7 7.7
413	595	606	616	627	637	648	658	669	679	690	8 8.8
414	700	711	721	731	742	752	763	773	784	794	9 9.9
415	805	815	826	836	847	857	868	878	888	899	
416	909	920	930	941	951	962	972	982	993	*003	
417	62 014	024	034	045	055	066	076	086	097	107	
418	118	128	138	149	159	170	180	190	201	211	
419	221	232	242	252	263	273	284	294	304	315	
420	325	335	346	356	366	377	387	397	408	418	
421	428	439	449	459	469	480	490	500	511	521	
422	531	542	552	562	572	583	593	603	613	624	**10**
423	634	644	655	665	675	685	696	706	716	726	
424	737	747	757	767	778	788	798	808	818	829	1 1.0
											2 2.0
425	839	849	859	870	880	890	900	910	921	931	3 3.0
426	941	951	961	972	982	992	*002	*012	*022	*033	4 4.0
427	63 043	053	063	073	083	094	104	114	124	134	5 5.0
428	144	155	165	175	185	195	205	215	225	236	6 6.0
429	246	256	266	276	286	296	306	317	327	337	7 7.0
											8 8.0
430	347	357	367	377	387	397	407	417	428	438	9 9.0
431	448	458	468	478	488	498	508	518	528	538	
432	548	558	568	579	589	599	609	619	629	639	
433	649	659	669	679	689	699	709	719	729	739	
434	749	759	769	779	789	799	809	819	829	839	
435	849	859	869	879	889	899	909	919	929	939	
436	949	959	969	979	988	998	*008	*018	*028	*038	
437	64 048	058	068	078	088	098	108	118	128	137	**9**
438	147	157	167	177	187	197	207	217	227	237	
439	246	256	266	276	286	296	306	316	326	335	1 0.9
											2 1.8
440	345	355	365	375	385	395	404	414	424	434	3 2.7
441	444	454	464	473	483	493	503	513	523	532	4 3.6
442	542	552	562	572	582	591	601	611	621	631	5 4.5
443	640	650	660	670	680	689	699	709	719	729	6 5.4
444	738	748	758	768	777	787	797	807	816	826	7 6.3
445	836	846	856	865	875	885	895	904	914	924	8 7.2
446	933	943	953	963	972	982	992	*002	*011	*021	9 8.1
447	65 031	040	050	060	070	079	089	099	108	118	
448	128	137	147	157	167	176	186	196	205	215	
449	225	234	244	254	263	273	283	292	302	312	
450	321	331	341	350	360	369	379	389	398	408	
N	**L 0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Prop. Pts.**

450–500

N	L 0	1	2	3	4	5	6	7	8	9
450	65 321	331	341	350	360	369	379	389	398	408
451	418	427	437	447	456	466	475	485	495	504
452	514	523	533	543	552	562	571	581	591	600
453	610	619	629	639	648	658	667	677	686	696
454	706	715	725	734	744	753	763	772	782	792
455	801	811	820	830	839	849	858	868	877	887
456	896	906	916	925	935	944	954	963	973	982
457	992	*001	*011	*020	*030	*039	*049	*058	*068	*077
458	66 087	096	106	115	124	134	143	153	162	172
459	181	191	200	210	219	229	238	247	257	266
460	276	285	295	304	314	323	332	342	351	361
461	370	380	389	398	408	417	427	436	445	455
462	464	474	483	492	502	511	521	530	539	549
463	558	567	577	586	596	605	614	624	633	642
464	652	661	671	680	689	699	708	717	727	736
465	745	755	764	773	783	792	801	811	820	829
466	839	848	857	867	876	885	894	904	913	922
467	932	941	950	960	969	978	987	997	*006	*015
468	67 025	034	043	052	062	071	080	089	099	108
469	117	127	136	145	154	164	173	182	191	201
470	210	219	228	237	247	256	265	274	284	293
471	302	311	321	330	339	348	357	367	376	385
472	394	403	413	422	431	440	449	459	468	477
473	486	495	504	514	523	532	541	550	560	569
474	578	587	596	605	614	624	633	642	651	660
475	669	679	688	697	706	715	724	733	742	752
476	761	770	779	788	797	806	815	825	834	843
477	852	861	870	879	888	897	906	916	925	934
478	943	952	961	970	979	988	997	*006	*015	*024
479	68 034	043	052	061	070	079	088	097	106	115
480	124	133	142	151	160	169	178	187	196	205
481	215	224	233	242	251	260	269	278	287	296
482	305	314	323	332	341	350	359	368	377	386
483	395	404	413	422	431	440	449	458	467	476
484	485	494	502	511	520	529	538	547	556	565
485	574	583	592	601	610	619	628	637	646	655
486	664	673	681	690	699	708	717	726	735	744
487	753	762	771	780	789	797	806	815	824	833
488	842	851	860	869	878	886	895	904	913	922
489	931	940	949	958	966	975	984	993	*002	*011
490	69 020	028	037	046	055	064	073	082	090	099
491	108	117	126	135	144	152	161	170	179	188
492	197	205	214	223	232	241	249	258	267	276
493	285	294	302	311	320	329	338	346	355	364
494	373	381	390	399	408	417	425	434	443	452
495	461	469	478	487	496	504	513	522	531	539
496	548	557	556	574	583	592	601	609	618	627
497	636	644	653	662	671	679	688	697	705	714
498	723	732	740	749	758	767	775	784	793	801
499	810	819	827	836	845	854	862	871	880	888
500	897	906	914	923	932	940	949	958	966	975
N	**L 0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**

Prop. Pts.	
	10
1	1.0
2	2.0
3	3.0
4	4.0
5	5.0
6	6.0
7	7.0
8	8.0
9	9.0
	9
1	0.9
2	1.8
3	2.7
4	3.6
5	4.5
6	5.4
7	6.3
8	7.2
9	8.1
	8
1	0.8
2	1.6
3	2.4
4	3.2
5	4.0
6	4.8
7	5.6
8	6.4
9	7.2

Prop. Pts.

500–550

N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.
500	69 897	906	914	923	932	940	949	958	966	975	
501	984	992	*001	*010	*018	*027	*036	*044	*053	*062	
502	70 070	079	088	096	105	114	122	131	140	148	
503	157	165	174	183	191	200	209	217	226	234	
504	243	252	260	269	278	286	295	303	312	321	
505	329	338	346	355	364	372	381	389	398	406	
506	415	424	432	441	449	458	467	475	484	492	**9**
507	501	509	518	526	535	544	552	561	569	578	
508	586	595	603	612	621	629	638	646	655	663	1 0.9
509	672	680	689	697	706	714	723	731	740	749	2 1.8
510	757	766	774	783	791	800	808	817	825	834	3 2.7 4 3.6 5 4.5
511	842	851	859	868	876	885	893	902	910	919	6 5.4
512	927	935	944	952	961	969	978	986	995	*003	7 6.3
513	71 012	020	029	037	046	054	063	071	079	088	8 7.2
514	096	105	113	122	130	139	147	155	164	172	9 8.1
515	181	189	198	206	214	223	231	240	248	257	
516	265	273	282	290	299	307	315	324	332	341	
517	349	357	366	374	383	391	399	408	416	425	
518	433	441	450	458	466	475	483	492	500	508	
519	517	525	533	542	550	559	567	575	584	592	
520	600	609	617	625	634	642	650	659	667	675	
521	684	692	700	709	717	725	734	742	750	759	
522	767	775	784	792	800	809	817	825	834	842	**8**
523	850	858	867	875	883	892	900	908	917	925	1 0.8
524	933	941	950	958	966	975	983	991	999	*008	2 1.6 3 2.4
525	72 016	024	032	041	049	057	066	074	082	090	4 3.2
526	099	107	115	123	132	140	148	156	165	173	5 4.0
527	181	189	198	206	214	222	230	239	247	255	6 4.8
528	263	272	280	288	296	304	313	321	329	337	7 5.6
529	346	354	362	370	378	387	395	403	411	419	8 6.4 9 7.2
530	428	436	444	452	460	469	477	485	493	501	
531	509	518	526	534	542	550	558	567	575	583	
532	591	599	607	616	624	632	640	648	656	665	
533	673	681	689	697	705	713	722	730	738	746	
534	754	762	770	779	787	795	803	811	819	827	
535	835	843	852	860	868	876	884	892	900	908	
536	916	925	933	941	949	957	965	973	981	989	
537	997	*006	*014	*022	*030	*038	*046	*054	*062	*070	**7**
538	73 078	086	094	102	111	119	127	135	143	151	1 0.7
539	159	167	175	183	191	199	207	215	223	231	2 1.4 3 2.1
540	239	247	255	263	272	280	288	296	304	312	4 2.8
541	320	328	336	344	352	360	368	376	384	392	5 3.5
542	400	408	416	424	432	440	448	456	464	472	6 4.2
543	480	488	496	504	512	520	528	536	544	552	7 4.9
544	560	568	576	584	592	600	608	616	624	632	8 5.6 9 6.3
545	640	648	656	664	672	679	687	695	703	711	
546	719	727	735	743	751	759	767	775	783	791	
547	799	807	815	823	830	838	846	854	862	870	
548	878	886	894	902	910	918	926	933	941	949	
549	957	965	973	981	989	997	*005	*013	*020	*028	
550	74 036	044	052	060	068	076	084	092	099	107	
N	**L 0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Prop. Pts.**

550–600

N	L 0	1	2	3	4	5	6	7	8	9
550	74 036	044	052	060	068	076	084	092	099	107
551	115	123	131	139	147	155	162	170	178	186
552	194	202	210	218	225	233	241	249	257	265
553	273	280	288	296	304	312	320	327	335	343
554	351	359	367	374	382	390	398	406	414	421
555	429	437	445	453	461	468	476	484	492	500
556	507	515	523	531	539	547	554	562	570	578
557	586	593	601	609	617	624	632	640	648	656
558	663	671	679	687	695	702	710	718	726	733
559	741	749	757	764	772	780	788	796	803	811
560	819	827	834	842	850	858	865	873	881	889
561	896	904	912	920	927	935	943	950	958	966
562	974	981	989	997	*005	*012	*020	*028	*035	*043
563	75 051	059	066	074	082	089	097	105	113	120
564	128	136	143	151	159	166	174	182	189	197
565	205	213	220	228	236	243	251	259	266	274
566	282	289	297	305	312	320	328	335	343	351
567	358	366	374	381	389	397	404	412	420	427
568	435	442	450	458	465	473	481	488	496	504
569	511	519	526	534	542	549	557	565	572	580
570	587	595	603	610	618	626	633	641	648	656
571	664	671	679	686	694	702	709	717	724	732
572	740	747	755	762	770	778	785	793	800	808
573	815	823	831	838	846	853	861	868	876	884
574	891	899	906	914	921	929	937	944	952	959
575	967	974	982	989	997	*005	*012	*020	*027	*035
576	76 042	050	057	065	072	080	087	095	103	110
577	118	125	133	140	148	155	163	170	178	185
578	193	200	208	215	223	230	238	245	253	260
579	268	275	283	290	298	305	313	320	328	335
580	343	350	358	365	373	380	388	395	403	410
581	418	425	433	440	448	455	462	470	477	485
582	492	500	507	515	522	530	537	545	552	559
583	567	574	582	589	597	604	612	619	626	634
584	641	649	656	664	671	678	686	693	701	708
585	716	723	730	738	745	753	760	768	775	782
586	790	797	805	812	819	827	834	842	849	856
587	864	871	879	886	893	901	908	916	923	930
588	938	945	953	960	867	975	982	989	997	*004
589	77 012	019	026	034	041	048	056	063	070	078
590	085	093	100	107	115	122	129	137	144	151
591	159	166	173	181	188	195	203	210	217	225
592	232	240	247	254	262	269	276	283	291	298
593	305	313	320	327	335	342	349	357	364	371
594	379	386	393	401	408	415	422	430	437	444
595	452	459	466	474	481	488	495	503	510	517
596	525	532	539	546	554	561	568	576	583	590
597	597	605	612	619	627	634	641	648	656	663
598	670	677	685	692	699	706	714	721	728	735
599	743	750	757	764	772	779	786	793	801	808
600	815	822	830	837	844	851	859	866	873	880

Prop. Pts.	8
1	0.8
2	1.6
3	2.4
4	3.2
5	4.0
6	4.8
7	5.6
8	6.4
9	7.2

Prop. Pts.	7
1	0.7
2	1.4
3	2.1
4	2.8
5	3.5
6	4.2
7	4.9
8	5.6
9	6.3

N L 0 1 2 3 4 5 6 7 8 9 Prop. Pts.

600–650

N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.
600	77 815	822	830	837	844	851	859	866	873	880	
601	887	895	902	909	916	924	931	938	945	952	
602	960	967	974	981	988	996	*003	*010	*017	*025	
603	78 032	039	046	053	061	068	075	082	089	097	
604	104	111	118	125	132	140	147	154	161	168	
605	176	183	190	197	204	211	219	226	233	240	
606	247	254	262	269	276	283	290	297	305	312	
607	319	326	333	340	347	355	362	369	376	383	**8**
608	390	398	405	412	419	426	433	440	447	455	1 0.8
609	462	469	476	483	490	497	504	512	519	526	2 1.6
610	533	540	547	554	561	569	576	583	590	597	3 2.4 4 3.2 5 4.0
611	604	611	618	625	633	640	647	654	661	668	6 4.8
612	675	682	689	696	704	711	718	725	732	739	7 5.6
613	746	753	760	767	774	781	789	796	803	810	8 6.4
614	817	824	831	838	845	852	859	866	873	880	9 7.2
615	888	895	902	909	916	923	930	937	944	951	
616	958	965	972	979	986	993	*000	*007	*014	*021	
617	79 029	036	043	050	057	064	071	078	085	092	
618	099	106	113	120	127	134	141	148	155	162	
619	169	176	183	190	197	204	211	218	225	232	
620	239	246	253	260	267	274	281	288	295	302	
621	309	316	323	330	337	344	351	358	365	372	
622	379	386	393	400	407	414	421	428	435	442	**7**
623	449	456	463	470	477	484	491	498	505	511	1 0.7
624	518	525	532	539	546	553	560	567	574	581	2 1.4 3 2.1
625	588	595	602	609	616	623	630	637	644	650	4 2.8
626	657	664	671	678	685	692	699	706	713	720	5 3.5
627	727	734	741	748	754	761	768	775	782	789	6 4.2
628	796	803	810	817	824	831	837	844	851	858	7 4.9
629	865	872	879	886	893	900	906	913	920	927	8 5.6 9 6.3
630	934	941	948	955	962	969	975	982	989	996	
631	80 003	010	017	024	030	037	044	051	058	065	
632	072	079	085	092	099	106	113	120	127	134	
633	140	147	154	161	168	175	182	188	195	202	
634	209	216	223	229	236	243	250	257	264	271	
635	277	284	291	298	305	312	318	325	332	339	
636	346	353	359	366	373	380	387	393	400	407	
637	414	421	428	434	441	448	455	462	468	475	**6**
638	482	489	496	502	509	516	523	530	536	543	1 0.6
639	550	557	564	570	577	584	591	598	604	611	2 1.2
640	618	625	632	638	645	652	659	665	672	679	3 1.8 4 2.4
641	686	693	699	706	713	720	726	733	740	747	5 3.0
642	754	760	767	774	781	787	794	801	808	814	6 3.6
643	821	828	835	841	848	855	862	868	875	882	7 4.2
644	889	895	902	909	916	922	929	936	943	949	8 4.8 9 5.4
645	956	963	969	976	983	990	996	*003	*010	*017	
646	81 023	030	037	043	050	057	064	070	077	084	
647	090	097	104	111	117	124	131	137	144	151	
648	158	164	171	178	184	191	198	204	211	218	
649	224	231	238	245	251	258	265	271	278	285	
650	291	298	305	311	318	325	331	338	345	351	
N	**L 0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Prop. Pts.**

650–700

N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.
650	81 291	298	305	311	318	325	331	338	345	351	
651	358	365	371	378	385	391	398	405	411	418	
652	425	431	438	445	451	458	465	471	478	485	
653	491	498	505	511	518	525	531	538	544	551	
654	558	564	571	578	584	591	598	604	611	617	
655	624	631	637	644	651	657	664	671	677	684	
656	690	697	704	710	717	723	730	737	743	750	
657	757	763	770	776	783	790	796	803	809	816	
658	823	829	836	842	849	856	862	869	875	882	
659	889	895	902	908	915	921	928	935	941	948	
660	954	961	968	974	981	987	994	*000	*007	*014	
661	82 020	027	033	040	046	053	060	066	073	079	**7**
662	086	092	099	105	112	119	125	132	138	145	
663	151	158	164	171	178	184	191	197	204	210	1 0.7
664	217	223	230	236	243	249	256	263	269	276	2 1.4
665	282	289	295	302	308	315	321	328	334	341	3 2.1
666	347	354	360	367	373	380	387	393	400	406	4 2.8
667	413	419	426	432	439	445	452	458	465	471	5 3.5
668	478	484	491	497	504	510	517	523	530	536	6 4.2
669	543	549	556	562	569	575	582	588	595	601	7 4.9
670	607	614	620	627	633	640	646	653	659	666	8 5.6
671	672	679	685	692	698	705	711	718	724	730	9 6.3
672	737	743	750	756	763	769	776	782	789	795	
673	802	808	814	821	827	834	840	847	853	860	
674	866	872	879	885	892	898	905	911	918	924	
675	930	937	943	950	956	963	969	975	982	988	
676	995	*001	*008	*014	*020	*027	*033	*040	*046	*052	
677	83 059	065	072	078	085	091	097	104	110	117	
678	123	129	136	142	149	155	161	168	174	181	
679	187	193	200	206	213	219	225	232	238	245	
680	251	257	264	270	276	283	289	296	302	308	
681	315	321	327	334	340	347	353	359	366	372	
682	378	385	391	398	404	410	417	423	429	436	**6**
683	442	448	455	461	467	474	480	487	493	499	
684	506	512	518	525	531	537	544	550	556	563	1 0.6
685	569	575	582	588	594	601	607	613	620	626	2 1.2
686	632	639	645	651	658	664	670	677	683	689	3 1.8
687	696	702	708	715	721	727	734	740	746	753	4 2.4
688	759	765	771	778	784	790	797	803	809	816	5 3.0
689	822	828	835	841	847	853	860	866	872	879	6 3.6
690	885	891	897	904	910	916	923	929	935	942	7 4.2
691	948	954	960	967	973	979	985	992	998	*004	8 4.8
692	84 011	017	023	029	036	042	048	055	061	067	9 5.4
693	073	080	086	092	098	105	111	117	123	130	
694	136	142	148	155	161	167	173	180	186	192	
695	198	205	211	217	223	230	236	242	248	255	
696	261	267	273	280	286	292	298	305	311	317	
697	323	330	336	342	348	354	361	367	373	379	
698	386	392	398	404	410	417	423	429	435	442	
699	448	454	460	466	473	479	485	491	497	504	
700	510	516	522	528	535	541	547	553	559	566	
N	**L 0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Prop. Pts.**

700–750

N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.
700	84 510	516	522	528	535	541	547	553	559	566	
701	572	578	584	590	597	603	609	615	621	628	
702	634	640	646	652	658	665	671	677	683	689	
703	696	702	708	714	720	726	733	739	745	751	
704	757	763	770	776	782	788	794	800	807	813	
705	819	825	831	837	844	850	856	862	868	874	
706	880	887	893	899	905	911	917	924	930	936	
707	942	948	954	960	967	973	979	985	991	997	**7**
708	85 003	009	016	022	028	034	040	046	052	058	1 0.7
709	065	071	077	083	089	095	101	107	114	120	2 1.4
710	126	132	138	144	150	156	163	169	175	181	3 2.1 4 2.8 5 3.5
711	187	193	199	205	211	217	224	230	236	242	6 4.2
712	248	254	260	266	272	278	285	291	297	303	7 4.9
713	309	315	321	327	333	339	345	352	358	364	8 5.6
714	370	376	382	388	394	400	406	412	418	425	9 6.3
715	431	437	443	449	455	461	467	473	479	485	
716	491	497	503	509	516	522	528	534	540	546	
717	552	558	564	570	576	582	588	594	600	606	
718	612	618	625	631	637	643	649	655	661	667	
719	673	679	685	691	697	703	709	715	721	727	
720	733	739	745	751	757	763	769	775	781	788	
721	794	800	806	812	818	824	830	836	842	848	
722	854	860	866	872	878	884	890	896	902	908	**6**
723	914	920	926	932	938	944	950	956	962	968	1 0.6
724	974	980	986	992	998	*004	*010	*016	*022	*028	2 1.2 3 1.8
725	86 034	040	046	052	058	064	070	076	082	088	4 2.4
726	094	100	106	112	118	124	130	136	141	147	5 3.0
727	153	159	165	171	177	183	189	195	201	207	6 3.6
728	213	219	225	231	237	243	249	255	261	267	7 4.2
729	273	279	285	291	297	303	308	314	320	326	8 4.8 9 5.4
730	332	338	344	350	356	362	368	374	380	386	
731	392	398	404	410	415	421	427	433	439	445	
732	451	457	463	469	475	481	487	493	499	504	
733	510	516	522	528	534	540	546	552	558	564	
734	570	576	581	587	593	599	605	611	617	623	
735	629	635	641	646	652	658	664	670	676	682	
736	688	694	700	705	711	717	723	729	735	741	
737	747	753	759	764	770	776	782	788	794	800	**5**
738	806	812	817	823	829	835	841	847	853	859	1 0.5
739	864	870	876	882	888	894	900	906	911	917	2 1.0 3 1.5
740	923	929	935	941	947	953	958	964	970	976	4 2.0 5 2.5
741	982	988	994	999	*005	*011	*017	*023	*029	*035	6 3.0
742	87 040	046	052	058	064	070	075	081	087	093	7 3.5
743	099	105	111	116	122	128	134	140	146	151	8 4.0
744	157	163	169	175	181	186	192	198	204	210	9 4.5
745	216	221	227	233	239	245	251	256	262	268	
746	274	280	286	291	297	303	309	315	320	326	
747	332	338	344	349	355	361	367	373	379	384	
748	390	396	402	408	413	419	425	431	437	442	
749	448	454	460	466	471	477	483	489	495	500	
750	506	512	518	523	529	535	541	547	552	558	
N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.

750–800

N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.
750	87 506	512	518	523	529	535	541	547	552	558	
751	564	570	576	581	587	593	599	604	610	616	
752	622	628	633	639	645	651	656	662	668	674	
753	679	685	691	697	703	708	714	720	726	731	
754	737	743	749	754	760	766	772	777	783	789	
755	795	800	806	812	818	823	829	835	841	846	
756	852	858	864	869	875	881	887	892	898	904	
757	910	915	921	927	933	938	944	950	955	961	
758	967	973	978	984	990	996	*001	*007	*013	*018	
759	88 024	030	036	041	047	053	058	064	070	076	
760	081	087	093	098	104	110	116	121	127	133	
761	138	144	150	156	161	167	173	178	184	190	**6**
762	195	201	207	213	218	224	230	235	241	247	
763	252	258	264	270	275	281	287	292	298	304	1 0.6
764	309	315	321	326	332	338	343	349	355	360	2 1.2
765	366	372	377	383	389	395	400	406	412	417	3 1.8
766	423	429	434	440	446	451	457	463	468	474	4 2.4
767	480	485	491	497	502	508	513	519	525	530	5 3.0
768	536	542	547	553	559	564	570	576	581	587	6 3.6
769	593	598	604	610	615	621	627	632	638	643	7 4.2
770	649	655	660	666	672	677	683	689	694	700	8 4.8
771	705	711	717	722	728	734	739	745	750	756	9 5.4
772	762	767	773	779	784	790	795	801	807	812	
773	818	824	829	835	840	846	852	857	863	868	
774	874	880	885	891	897	902	908	913	919	925	
775	930	936	941	947	953	958	964	969	975	981	
776	986	992	997	*003	*009	*014	*020	*025	*031	*037	
777	89 042	048	053	059	064	070	076	081	087	092	
778	098	104	109	115	120	126	131	137	143	148	
779	154	159	165	170	176	182	187	193	198	204	
780	209	215	221	226	232	237	243	248	254	260	
781	265	271	276	282	287	293	298	304	310	315	
782	321	326	332	337	343	348	354	360	365	371	**5**
783	376	382	387	393	398	404	409	415	421	426	
784	432	437	443	448	454	459	465	470	476	481	1 0.5
785	487	492	498	504	509	515	520	526	531	537	2 1.0
786	542	548	553	559	564	570	575	581	586	592	3 1.5
787	597	603	609	614	620	625	631	636	642	647	4 2.0
788	653	658	664	669	675	680	686	691	697	702	5 2.5
789	708	713	719	724	730	735	741	746	752	757	6 3.0
790	763	768	774	779	785	790	796	801	807	812	7 3.5
791	818	823	829	834	840	845	851	856	862	867	8 4.0
792	873	878	883	889	894	900	905	911	916	922	9 4.5
793	927	933	938	944	949	955	960	966	971	977	
794	982	988	993	998	*004	*009	*015	*020	*026	*031	
795	90 037	042	048	053	059	064	069	075	080	086	
796	091	097	102	108	113	119	124	129	135	140	
797	146	151	157	162	168	173	179	184	189	195	
798	200	206	211	217	222	227	233	238	244	249	
799	255	260	266	271	276	282	287	293	298	304	
800	309	314	320	325	331	336	342	347	352	358	
N	**L 0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Prop. Pts.**

800–850

N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.
800	90 309	314	320	325	331	336	342	347	352	358	
801	363	369	374	380	385	390	396	401	407	412	
802	417	423	428	434	439	445	450	455	461	466	
803	472	477	482	488	493	499	504	509	515	520	
804	526	531	536	542	547	553	558	563	569	574	
805	580	585	590	596	601	607	612	617	623	628	
806	634	639	644	650	655	660	666	671	677	682	
807	687	693	698	703	709	714	720	725	730	736	
808	741	747	752	757	763	768	773	779	784	789	
809	795	800	806	811	816	822	827	832	838	843	
810	849	854	859	865	870	875	881	886	891	897	
811	902	907	913	918	924	929	934	940	945	950	**6**
812	956	961	966	972	977	982	988	993	998	*004	
813	91 009	014	020	025	030	036	041	046	052	057	1 0.6
814	062	068	073	078	084	089	094	100	105	110	2 1.2
815	116	121	126	132	137	142	148	153	158	164	3 1.8
816	169	174	180	185	190	196	201	206	212	217	4 2.4
817	222	228	233	238	243	249	254	259	265	270	5 3.0
818	275	281	286	291	297	302	307	312	318	323	6 3.6
819	328	334	339	344	350	355	360	365	371	376	7 4.2
820	381	387	392	397	403	408	413	418	424	429	8 4.8
821	434	440	445	450	455	461	466	471	477	482	9 5.4
822	487	492	498	503	508	514	519	524	529	535	
823	540	545	551	556	561	566	572	577	582	587	
824	593	598	603	609	614	619	624	630	635	640	
825	645	651	656	661	666	672	677	682	687	693	
826	698	703	709	714	719	724	730	735	740	745	
827	751	756	761	766	772	777	782	787	793	798	
828	803	808	814	819	824	829	834	840	845	850	
829	855	861	866	871	876	882	887	892	897	903	
830	908	913	918	924	929	934	939	944	950	955	
831	960	965	971	976	981	986	991	997	*002	*007	
832	92 012	018	023	028	033	038	044	049	054	059	**5**
833	065	070	075	080	085	091	096	101	106	111	
834	117	122	127	132	137	143	148	153	158	163	1 0.5
835	169	174	179	184	189	195	200	205	210	215	2 1.0
836	221	226	231	236	241	247	252	257	262	267	3 1.5
837	273	278	283	288	293	298	304	309	314	319	4 2.0
838	324	330	335	340	345	350	355	361	366	371	5 2.5
839	376	381	387	392	397	402	407	412	418	423	6 3.0
840	428	433	438	443	449	454	459	464	469	474	7 3.5
841	480	485	490	495	500	505	511	516	521	526	8 4.0
842	531	536	542	547	552	557	562	567	572	578	9 4.5
843	583	588	593	598	603	609	614	619	624	629	
844	634	639	645	650	655	660	665	670	675	681	
845	686	691	696	701	706	711	716	722	727	732	
846	737	742	747	752	758	763	768	773	778	783	
847	788	793	799	804	809	814	819	824	829	834	
848	840	845	850	855	860	865	870	875	881	886	
849	891	896	901	906	911	916	921	927	932	937	
850	942	947	952	957	962	967	973	978	983	988	
N	**L 0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Prop. Pts.**

850–900

N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.
850	92 942	947	952	957	962	967	973	978	983	988	
851	993	998	*003	*008	*013	*018	*024	*029	*034	*039	
852	93 044	049	054	059	064	069	075	080	085	090	
853	095	100	105	110	115	120	125	131	181	141	
854	146	151	156	161	166	171	176	181	186	192	
855	197	202	207	212	217	222	227	232	237	242	
856	247	252	258	263	268	273	278	283	288	293	**6**
857	298	303	308	313	318	323	328	334	339	344	
858	349	354	359	364	369	374	379	384	389	394	1 0.6
859	399	404	409	414	420	425	430	435	440	445	2 1.2
860	450	455	460	465	470	475	480	485	490	495	3 1.8 4 2.4 5 3.0
861	500	505	510	515	520	526	531	536	541	546	6 3.6
862	551	556	561	566	571	576	581	586	591	596	7 4.2
863	601	606	611	616	621	626	631	636	641	646	8 4.8
864	651	656	661	666	671	676	682	687	692	697	9 5.4
865	702	707	712	717	722	727	732	737	742	747	
866	752	757	762	767	772	777	782	787	792	797	
867	802	807	812	817	822	827	832	837	842	847	
868	852	857	862	867	872	877	882	887	892	897	
869	902	907	912	917	922	927	932	937	942	947	
870	952	957	962	967	972	977	982	987	992	997	
871	94 002	007	012	017	022	027	032	037	042	047	**5**
872	052	057	062	067	072	077	082	086	091	096	
873	101	106	111	116	121	126	131	136	141	146	1 0.5
874	151	156	161	166	171	176	181	186	191	196	2 1.0
875	201	206	211	216	221	226	231	236	240	245	3 1.5 4 2.0 5 2.5
876	250	255	260	265	270	275	280	285	290	295	6 3.0
877	300	305	310	315	320	325	330	335	340	345	7 3.5
878	349	354	359	364	369	374	379	384	389	394	8 4.0
879	399	404	409	414	419	424	429	433	438	443	9 4.5
880	448	453	458	463	468	473	478	483	488	493	
881	498	503	507	512	517	522	527	532	537	542	
882	547	552	557	562	567	571	576	581	586	591	
883	596	601	606	611	616	621	626	630	635	640	
884	645	650	655	660	665	670	675	680	685	689	
885	694	699	704	709	714	719	724	729	734	738	
886	743	748	753	758	763	768	773	778	783	787	
887	792	797	802	807	812	817	822	827	832	836	**4**
888	841	846	851	856	861	866	871	876	880	885	1 0.4
889	890	895	900	905	910	915	919	924	929	934	2 0.8
890	939	944	949	954	959	963	968	973	978	983	3 1.2 4 1.6 5 2.0
891	988	993	998	*002	*007	*012	*017	*022	*027	*032	6 2.4
892	95 036	041	046	051	056	061	066	071	075	080	7 2.8
893	085	090	095	100	105	109	114	119	124	129	8 3.2
894	134	139	143	148	153	158	163	168	173	177	9 3.6
895	182	187	192	197	202	207	211	216	221	226	
896	231	236	240	245	250	255	260	265	270	274	
897	279	284	289	294	299	303	308	313	318	323	
898	328	332	337	342	347	352	357	361	366	371	
899	376	381	386	390	395	400	405	410	415	419	
900	424	429	434	439	444	448	453	458	463	468	
N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.

900–950

N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.
900	95 424	429	434	439	444	448	453	458	463	468	
901	472	477	482	487	492	497	501	506	511	516	
902	521	525	530	535	540	545	550	554	559	564	
903	569	574	578	583	588	593	598	602	607	612	
904	617	622	626	631	636	641	646	650	655	660	
905	665	670	674	679	684	689	694	698	703	708	
906	713	718	722	727	732	737	742	746	751	756	
907	761	766	770	775	780	785	789	794	799	804	
908	809	813	818	823	828	832	837	842	847	852	
909	856	861	866	871	875	880	885	890	895	899	
910	904	909	914	018	923	928	933	938	942	947	
911	952	957	961	966	971	976	980	985	990	995	**5**
912	999	*004	*009	*014	*019	*023	*028	*033	*038	*042	
913	96 047	052	057	061	066	071	076	080	085	090	1 0.5
914	095	099	104	109	114	118	123	128	133	137	2 1.0
915	142	147	152	156	161	166	171	175	180	185	3 1.5
916	190	194	199	204	209	213	218	223	227	232	4 2.0
917	237	242	246	251	256	261	265	270	275	280	5 2.5
918	284	289	294	298	303	308	313	317	322	327	6 3.0
919	332	336	341	346	350	355	360	365	369	374	7 3.5
920	379	384	388	393	398	402	407	412	417	421	8 4.0
921	426	431	435	440	445	450	454	459	464	468	9 4.5
922	473	478	483	487	492	497	501	506	511	515	
923	520	525	530	534	539	544	548	553	558	562	
924	567	572	577	581	586	591	595	600	605	609	
925	614	619	624	628	633	638	642	647	652	656	
926	661	666	670	675	680	685	689	694	699	703	
927	708	713	717	722	727	731	736	741	745	750	
928	755	759	764	769	774	778	783	788	792	797	
929	802	806	811	816	820	825	830	834	839	844	
930	848	853	858	862	876	872	876	881	886	890	
931	895	900	904	909	914	918	923	928	932	937	
932	942	946	951	956	960	965	970	974	979	984	**4**
933	988	993	997	*002	*007	*011	*016	*021	*025	*030	
934	97 035	039	044	049	053	058	063	067	072	077	1 0.4
935	081	086	090	095	100	104	109	114	118	123	2 0.8
936	128	132	137	142	146	151	155	160	165	169	3 1.2
937	174	179	183	188	192	197	202	206	211	216	4 1.6
938	220	225	230	234	239	243	248	253	257	262	5 2.0
939	267	271	276	280	285	290	294	299	304	308	6 2.4
940	313	317	322	327	331	336	340	345	350	354	7 2.8
941	359	364	368	373	377	382	387	391	396	400	8 3.2
942	405	410	414	419	424	428	433	437	442	447	9 3.6
943	451	456	460	465	470	474	479	483	488	493	
944	497	502	506	511	516	520	525	529	534	539	
945	543	548	552	557	562	566	571	575	580	585	
946	589	594	598	603	607	612	617	621	626	630	
947	635	640	644	649	653	658	663	667	672	676	
948	681	685	690	695	699	704	708	713	717	722	
949	727	731	736	740	745	749	754	759	763	768	
950	772	777	782	786	791	795	800	804	809	813	
N	**L 0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Prop. Pts.**

950–1000

N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.
950	97 772	777	782	786	791	795	800	804	809	813	
951	818	823	827	832	836	841	845	850	855	859	
952	864	868	873	877	882	886	891	896	900	905	
953	909	914	918	923	928	932	937	941	946	950	
954	955	959	964	968	973	978	982	987	991	996	
955	98 000	005	009	014	019	023	028	032	037	041	
956	046	050	055	059	064	068	073	078	082	087	
957	091	096	100	105	109	114	118	123	127	132	
958	137	141	146	150	155	159	164	168	173	177	
959	182	186	191	195	200	204	209	214	218	223	
960	227	232	236	241	245	250	254	259	263	268	
961	272	277	281	286	290	295	299	304	308	313	**5**
962	318	322	327	331	336	340	345	349	354	358	
963	363	367	372	376	381	385	390	394	399	403	1 0.5
964	408	412	417	421	426	430	435	439	444	448	2 1.0
965	453	457	462	466	471	475	480	484	489	493	3 1.5 4 2.0 5 2.5
966	498	502	507	511	516	520	525	529	534	538	6 3.0
967	543	547	552	556	561	565	570	574	579	583	7 3.5
968	588	592	597	601	605	610	614	619	623	628	8 4.0
969	632	637	641	646	650	655	659	664	668	673	9 4.5
970	677	682	686	691	695	700	704	709	713	717	
971	722	726	731	735	740	744	749	753	758	762	
972	767	771	776	780	784	789	793	798	802	807	
973	811	816	820	825	829	834	838	843	847	851	
974	856	860	865	869	874	878	883	887	892	896	
975	900	905	909	914	918	923	927	932	936	941	
976	945	949	954	958	963	967	972	976	981	985	
977	989	994	998	*003	*007	*012	*016	*021	*025	*029	
978	99 034	038	043	047	052	056	061	065	069	074	
979	078	083	087	092	096	100	105	109	114	118	
980	123	127	131	136	140	145	149	154	158	162	
981	167	171	176	180	185	189	193	198	202	207	**4**
982	211	216	220	224	229	233	238	242	247	251	
983	255	260	264	269	273	277	282	286	291	295	1 0.4
984	300	304	308	313	317	322	326	330	335	339	2 0.8 3 1.2
985	344	348	352	357	361	366	370	374	379	383	4 1.6
986	388	392	396	401	405	410	414	419	423	427	5 2.0
987	432	436	441	445	449	454	458	463	467	471	6 2.4
988	476	480	484	489	493	498	502	506	511	515	7 2.8
989	520	524	528	533	537	542	546	550	555	559	8 3.2 9 3.6
990	564	568	572	577	581	585	590	594	599	603	
991	607	612	616	621	625	629	634	638	642	647	
992	651	656	660	664	669	673	677	682	686	691	
993	695	699	704	708	712	717	721	726	730	734	
994	739	743	747	752	756	760	765	769	774	778	
995	782	787	791	795	800	804	808	813	817	822	
996	826	830	835	839	843	848	852	856	861	865	
997	870	874	878	883	887	891	896	900	904	909	
998	913	917	922	926	930	935	939	944	948	952	
999	957	961	965	970	974	978	983	987	991	996	
1000	00 000	004	009	013	017	022	026	030	035	039	
N	L 0	1	2	3	4	5	6	7	8	9	Prop. Pts.

	Number	Logarithm
Base of Naperian logarithms . . . . . e	= 2.71828183	0.4342945
Modulus of common logarithms . . . . . u	= 0.43429448	9.6377843–10
Reciprocal of modulus . . . . . $\frac{1}{u}$	= 2.30258509	
Circumference of a circle in degrees	= 360	2.5563025
Circumference of a circle in minutes	= 21600	4.3344538
Circumference of a circle in seconds	=1296000	6.1126050
Radian expressed in degrees	= 57.29578	1.7581226
Radian expressed in minutes	= 3437.7468	3.5362739
Radian expressed in seconds	= 206264.806	5.3144251
Ratio of a circumference to diameter . . . . π	= 3.14159265	0.4971499

π = 3.14159 26535 89793 23846 26433 8328

	Number	Logarithm		Number	Logarithm
2π	= 6.28318531	0.7981799	π^2	= 9.86960440	0.9942997
4π	= 12.56637061	1.0992099	$\frac{1}{\pi^2}$	= 0.10132118	9.0057003–10
$\frac{\pi}{2}$	= 1.57079633	0.1961199	$\sqrt{\pi}$	= 1.77245385	0.2485749
$\frac{\pi}{3}$	= 1.04719755	0.0200286	$\frac{1}{\sqrt{\pi}}$	= 0.56418958	9.7514251–10
$\frac{4\pi}{3}$	= 4.18879020	0.6220886	$\sqrt{\frac{3}{\pi}}$	= 0.97720502	9.9899857–10
$\frac{\pi}{4}$	= 0.78539816	9.8950899–10	$\sqrt{\frac{4}{\pi}}$	= 1.12837917	0.0524551
$\frac{\pi}{6}$	= 0.52359878	9.7189986–10	$\sqrt[3]{\pi}$	= 1.46459189	0.1657166
$\frac{1}{\pi}$	= 0.31830989	9.5028501–10	$\frac{1}{\sqrt[3]{\pi}}$	= 0.68278406	9.8342834–10
$\frac{1}{2\pi}$	= 0.15915494	9.2018201–10	$\sqrt[3]{\pi^2}$	= 2.14502940	0.3314332
$\frac{3}{\pi}$	= 0.95492966	9.9799714–10	$\sqrt{\frac{3}{4\pi}}$	= 0.62035049	9.7926371–10
$\frac{4}{\pi}$	= 1.27323954	0.1049101	$\sqrt[3]{\frac{\pi}{6}}$	= 0.80599598	9.9063329–10

If the radius r = 1, the length of the arc is

for 1 degree = $\frac{\pi}{180}$	= 0.01745329	8.2418774–10
for 1 minute = $\frac{\pi}{10800}$	= 0.00029089	6.4637261–10
for 1 second = $\frac{\pi}{648000}$	= 0.00000485	4.6855749–10
sin 1″	= 0.00000485	4.6855749–10

TABLE IX

NATURAL LOGARITHMS OF NUMBERS

BASE $e = 2.71828...$

NOTE. — $\text{Log}_e 10N = \text{Log}_e N + \text{Log}_e 10$

$$\text{Log}_e \frac{N}{10} = \text{Log}_e N - \text{Log}_e 10$$

$\text{Log}_e 10 = 2.30259$

For example: $\text{Log}_e 27 = \text{Log}_e 2.7 + \text{Log}_e 10$
$= 0.99325 + 2.30259 = 3.29584$

$\text{Log}_e .27 = \text{Log}_e 2.7 - \text{Log}_e 10$
$= 0.99325 - 2.30259 = 8.69066 - 10$

N	0	1	2	3	4	5	6	7	8	9
1.0	0.0 0000	0995	1980	2956	3922	4879	5827	6766	7696	8618
1.1	9531	*0436	*1333	*2222	*3103	*3976	*4842	*5700	*6551	*7395
1.2	0.1 8232	9062	9885	*0701	*1511	*2314	*3111	*3902	*4686	*5464
1.3	0.2 6236	7003	7763	8518	9267	*0010	*0748	*1481	*2208	*2930
1.4	0.3 3647	4359	5066	5767	6464	7156	7844	8526	9204	9878
1.5	0.4 0547	1211	1871	2527	3178	3825	4469	5108	5742	6373
1.6	7000	7623	8243	8858	9470	*0078	*0682	*1282	*1879	*2473
1.7	0.5 3063	3649	4232	4812	5389	5962	6531	7098	7661	8222
1.8	8779	9333	9884	*0432	*0977	*1519	*2078	*2594	*3127	*3658
1.9	0.6 4185	4710	5233	5752	6269	6783	7294	7803	8310	8813
2.0	9315	9813	*0310	*0804	*1295	*1784	*2271	*2755	*3237	*3716
2.1	0.7 4194	4669	5142	5612	6081	6547	7011	7473	7932	8390
2.2	8846	9299	9751	*0200	*0648	*1093	*1536	*1978	*2418	*2855
2.3	0.8 3291	3725	4157	4587	5015	5442	5866	6289	6710	7129
2.4	7547	7963	8377	8789	9200	9609	*0016	*0422	*0826	*1228
2.5	0.9 1629	2028	2426	2822	3216	3609	4001	4391	4779	5166
2.6	5551	5935	6317	6698	7078	7456	7833	8208	8582	8954
2.7	9325	9695	*0063	*0430	*0796	*1160	*1523	*1885	*2245	*2604
2.8	1.0 2962	3318	3674	4028	4380	4732	5082	5431	5779	6126
2.9	6471	6815	7158	7500	7841	8181	8519	8856	9192	9527
3.0	9861	*0194	*0526	*0856	*1186	*1514	*1841	*2168	*2493	*2817
3.1	1.1 3140	3462	3783	4103	4422	4740	5057	5373	5688	6002
3.2	6315	6627	6938	7248	7557	7865	8173	8479	8784	9089
3.3	9392	9695	9996	*0297	*0597	*0896	*1194	*1491	*1788	*2083
3.4	1.2 2378	2671	2964	3256	3547	3837	4127	4415	4703	4990
3.5	5276	5562	5846	6130	6413	6695	6976	7257	7536	7815
3.6	8093	8371	8647	8923	9198	9473	9746	*0019	*0291	*0563
3.7	1.3 0833	1103	1372	1641	1909	2176	2442	2708	2972	3237
3.8	3500	3763	4025	4286	4547	4807	5067	5325	5584	5841
3.9	6098	6354	6609	6864	7118	7372	7624	7877	8128	8379
4.0	8629	8879	9128	9377	9624	9872	*0118	*0364	*0610	*0854
4.1	1.4 1099	1342	1585	1828	2070	2311	2552	2792	3031	3270
4.2	3508	3746	3984	4220	4456	4692	4927	5161	5395	5629
4.3	5862	6094	6326	6557	6787	7018	7247	7476	7705	7933
4.4	8160	8387	8614	8840	9065	9290	9515	9739	9962	*0185
4.5	1.5 0408	0630	0851	1072	1293	1513	1732	1951	2170	2388
4.6	2606	2823	3039	3256	3471	3687	3902	4116	4330	4543
4.7	4756	4969	5181	5393	5604	5814	6025	6235	6444	6653
4.8	6862	7070	7277	7485	7691	7898	8104	8309	8515	8719
4.9	8924	9127	9331	9534	9737	9939	*0141	*0342	*0543	*0744
5.0	1.6 0944	1144	1343	1542	1741	1939	2137	2334	2531	2728
N	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**

N	0	1	2	3	4	5	6	7	8	9
5.0	1.6 0944	1144	1343	1542	1741	1939	?137	2334	2531	2728
5.1	2924	3120	3315	3511	3705	3900	4094	4287	4481	4673
5.2	4866	5058	5250	5441	5632	5823	6013	6203	6393	6582
5.3	6771	6959	7147	7335	7523	7710	7896	8083	8269	8455
5.4	8640	8825	9010	9194	9378	9562	9745	9928	*0111	*0293
5.5	1.7 0475	0656	0838	1019	1199	1380	1560	1740	1919	2098
5.6	2277	2455	2633	2811	2988	3166	3342	3519	3695	3871
5.7	4047	4222	4397	4572	4746	4920	5094	5267	5440	5613
5.8	5786	5958	6130	6302	6473	6644	6815	6985	7156	7326
5.9	7495	7665	7834	8002	8171	8339	8507	8675	8842	9009
6.0	9176	9342	9509	9675	9840	*0006	*0171	*0336	*0500	*0665
6.1	1.8 0829	0993	1156	1319	1482	1645	1808	1970	2132	2294
6.2	2455	2616	2777	2938	3098	3258	3418	3578	3737	3896
6.3	4055	4214	4372	4530	4688	4845	5003	5160	5317	5473
6.4	5630	5786	5942	6097	6253	6408	6563	6718	6872	7026
6.5	7180	7334	7487	7641	7794	7947	8099	8251	8403	8555
6.6	8707	8858	9010	9160	9311	9462	9612	9762	9912	*0061
6.7	1.9 0211	0360	0509	0658	0806	0954	1102	1250	1398	1545
6.8	1692	1839	1986	2132	2279	2425	2571	2716	2862	3007
6.9	3152	3297	3442	3586	3730	3874	4018	4162	4305	4448
7.0	4591	4734	4876	5019	5161	5303	5445	5586	5727	5869
7.1	6009	6150	6291	6431	6571	6711	6851	6991	7130	7269
7.2	7408	7547	7685	7824	7962	8100	8238	8376	8513	8650
7.3	8787	8924	9061	9198	9334	9470	9606	9742	9877	*0013
7.4	2.0 0148	0283	0418	0553	0687	0821	0956	1089	1223	1357
7.5	1490	1624	1757	1890	2022	2155	2287	2419	2551	2683
7.6	2815	2946	3078	3209	3340	3471	3601	3732	3862	3992
7.7	4122	4252	4381	4511	4640	4769	4898	5027	5156	5284
7.8	5412	5540	5668	5796	5924	6051	6179	6306	6433	6560
7.9	6686	6813	6939	7065	7191	7317	7443	7568	7694	7819
8.0	7944	8069	8194	8318	8443	8567	8691	8815	8939	9063
8.1	9186	9310	9433	9556	9679	9802	9924	*0047	*0169	*0291
8.2	2.1 0413	0535	0657	0779	0900	1021	1142	1263	1384	1505
8.3	1626	1746	1866	1986	2106	2226	2346	2465	2585	2704
8.4	2823	2942	3061	3180	3298	3417	3535	3653	3771	3889
8.5	4007	4124	4242	4359	4476	4593	4710	4827	4943	5060
8.6	5176	5292	5409	5524	5640	5756	5871	5987	6102	6217
8.7	6332	6447	6562	6677	6791	6905	7020	7134	7248	7361
8.8	7475	7589	7702	7816	7929	8042	8155	8267	8380	8493
8.9	8605	8717	8830	8942	9054	9165	9277	9389	9500	9611
9.0	9722	9834	9944	*0055	*0166	*0276	*0387	*0497	*0607	*0717
9.1	2.2 0827	0937	1047	1157	1266	1375	1485	1594	1703	1812
9.2	1920	2029	2138	2246	2354	2462	2570	2678	2786	2894
9.3	3001	3109	3216	3324	3431	3538	3645	3751	3858	3965
9.4	4071	4177	4284	4390	4496	4601	4707	4813	4918	5024
9.5	5129	5234	5339	5444	5549	5654	5759	5863	5968	6072
9.6	6176	6280	6384	6488	6592	6696	6799	6903	7006	7109
9.7	7213	7316	7419	7521	7624	7727	7829	7932	8034	8136
9.8	8238	8340	8442	8544	8646	8747	8849	8950	9051	9152
9.9	9253	9354	9455	9556	9657	9757	9858	9958	*0058	*0158
10.0	2.3 0259	0358	0458	0558	0658	0757	0857	0956	1055	1154
N	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**